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THE GAS CONSUMERS' ASSOCIATION AND THE NEW YORK STATE POLITICAL CANVASS.

When the pet scheme concocted by the Gas Consumers' Association for the purpose of saddling on the gas companies of New York city the duty of maintaining a commission charged with the regulation of the metropolitan gas supply, at an estimated annual outlay (to the gas purveyors) of $40,000, was defeated by adverse vote of the New York State Assemblymen, on date of April 30th last, the "gas reformers" were thrown into a sort or species of mental condition that hovered between despair and insanity. When the most acute symptoms of their peculiar malady had been dulled, as a consequence of the "passing of the days," the doughty band resolved and determined it should make itself further heard in the matters over which it held a self-constituted conservatorship. With that great display of genius so characteristic of all its public doings, the Association concluded it would be a masterstroke to "print a book," and distribute or circulate the same among the constituents of those legislators whose negative votes had doomed the commission measure to quiet and dusty repose in the many pigeon holes which serve as burying places for "defeated bills." The "book," of course, was to contain a full explanation of the blessings which would have been reaped by the gas consumers of New York city had the Sherwood-Thurber-Schultz *et al* measure been made a law; and it was also to specify the corrupt manner in which the project was defeated. The title selected for the wonderful volume was, "The History of a Legislative Shame," and the "history" was duly circulated in the districts represented by the defaulting Assemblymen. Not satisfied with that effort, at about the time the nominations for legislators to serve in 1886 were to be made, the same districts were thickly strewn with another literary production (the last one was a letter) of the "reformers," and this time they had grown bolder, or at least more rabid, in the nature of the assertions put forward. Incidentally, though, it might be remarked the letter bore no individual signatures, the utterers thereof hiding their identity under the shield afforded by the term, "The Gas Consumers' Association." We do not here propose to follow out the effect exerted on each individual aspirant for an assembly nomination who was thus attacked, but will single out the most noteworthy case, and present it as a fair sample of the success that attended the operations of the libellous action of the association clique.

The Hon. Geo. W. Greene represented, in the 1885 session of the New York State Legislature, the second assembly district of Orange county. The voters who selected him to watch over their interests will, as a class, compare most favorably in point of intelligence and discrimination with those from any other section of the Empire State. Mr. Greene's legislative course at Albany was carefully observed by those who sent him there; they had no complaint to make with regard to his fidelity and honesty. In short, they were perfectly satisfied with their servant's record; and, knowing this to be the case, naturally enough Mr. Greene placed himself in the field as a candidate for renomination at the hands of his party. When such candidacy was announced the "reformers" put in motion the wheels of their "literary bureau," and the second district of Orange was literally covered with their "tracts." The attacked aspirant met the slanderous charges in a manly way, and appealed to the Monroe *Herald* to grant him space in its columns to the end that he might refute the slanders insinuated (rather than openly charged) against him by his anonymous foes. The proprietor of the *Herald* immediately assented, with the following result. Mr. Greene opened his

attack by stating that the Gas Consumers' Association had been flooding the assembly district with copies of a letter which "broadly insinuated that your representative is corrupt, and that the association is in possession of damaging facts to substantiate their insinuations, which will be forthcoming in case the incumbent should be renominated. It is difficult to write of such dastardly and scoundrelly assassins with any degree of moderation. The men who wrote and are causing to be circulated that letter knew they were infamous liars when they insinuated that they or anyone else are in possession of a single fact even tending to establish venality or corruption on the part of your representative. He challenges them to publish any such charge over their signatures, that the person so publishing may show his willingness to assume the responsibility of his charge, and no longer cowardly hide behind the name of the Gas Consumers' Association."

Now it would appear to the impartial observer that this language was sufficiently plain to be understandable; and, in fact, it might be voted by some as rather emphatic, if not decidedly pungent. However, the parties challenged made no response, and the possessors of the "damaging facts" held their peace and their tongues—at least so our information goes, and we have no reason to doubt the correctness of the story. While the first portion of Mr. Greene's published answer to his would-be defamers' aspersions is sufficiently interesting, it is where the gentleman goes on to give some of the reasons why he opposed the original commission measure that he becomes particularly instructive. After alluding to objections held by him against sections four and ten—and these alone would furnish sufficient cause whereon to base a negative vote—he said:

"Section twelve of the proposed bill contained the following: "The corporations affected by this act shall provide the most approved appliances for correctly ascertaining the amount of gas supplied to consumers at the *place of consumption*, and for preventing the waste of gas, and also for properly testing its quality, purity, illuminating power, and pressure, as *said board shall from time to time direct.*'" The italics are ours.

From that wording of the section Mr. Greene directs attention to the fact that absolute power would be vested in the commissioners to say whose patent and whose meter should be put in use in every house and business place in the city, and without any limit as to how often they might be changed. If the commissioners said, "Jones' is the meter, Jones' must go in." Of course, it is easy to see, in the light of all this, where the possibilities of a pretty job were concealed. In the second bill presented the defects in sections four and ten were partially remedied, but the features of section twelve were reincorporated in the amended measure under the section numbered six. While the second bill was being considered in the Senate, reformer F. B. Thurber was told by Mr. Greene that if the sixth section were properly amended he (Mr. Greene) would vote for the bill in the House. Messrs. Sherwood and Potter, of Consumers' Association, approved of the amendment, but Mr. Thurber held out. The amendment proposed by Mr. Greene provided for the appointment "of a competent board of three who should make a public test and trial of the various instruments used for measuring gas, and who should make an award in accordance with the results of such trial; that when changes were made the meter thus receiving the award should be used; that no subsequent change should be made within a year, and not then without a like public test, trial and award." This amendment, chiefly (as asserted by Mr. Greene) through the influence of the Thurber interest, was rejected; and Mr. G. thus accounts for "reformer" Thurber's pertinacity in regard thereto:

"But Mr. Thurber and his attorneys have not left the matter in doubt. Hon. S. T. Hopkins, of Greene county, N. Y., informed me at the time of the Grant funeral ceremonies that Mr. Thurber had solicited him to take $10,000 of the stock in a new meter company then formed or to be formed, and in which Mr. Thurber was interested. Hon. John Raines, of Ontario county, N. Y., on the same occasion informed me that Mr. E. B. Harper, President of the Mutual Reserve Fund Life Association, of New York city, had stated to him that one of Mr. Thurber's attorneys had solicited him (Mr. Harper) to take $5,000 of the stock of the new meter company." Of course, under such circumstances, there is little reason for wondering why Mr. Thurber was solicitous about the fate of section six. As said before, all this has been public property for some time back, and may be found in the columns of the Monroe *Herald*, of date of October 6th.

To show what effect was carried by the annonymous publications referred to, we may state that Mr. Greene was renominated and re-elected; and a like result appears to have followed in other localities of the State where the "Consumers' Association" tried the "offensive partisanship" dodge.

GAS-HEATED BAKERS' OVENS.

If one may judge from the crowds continually surrounding the booth occupied by the "Martha Washington Flour Company's" exhibit at the American Institute Fair, now being held in this city, we should certainly conclude that cooking by the aid of gas heat is an object of decided interest to the public. The exhibit is located in Section 20, on main floor of Institute building, and the exhibitors have leased, and keep in active duty in their stall, a specimen of the Thompson Oven Company's portable iron gas oven. The oven structure is 48 inches in height, 41 inches in depth, and 33 inches wide; the oven compartment proper is divided by a central shelf, and is calculated for a baking duty of 300 pounds of flour in ten hours, with a gas consumption of 21 cubic feet per hour. The cook in charge of the oven at the Fair says the work accomplished by it is perfectly satisfactory in every respect. The working heat may be reduced or increased at will. We would advise every visiting gas man to make an inspection of its operation.

PERSONAL.

In our comments in last issue on the Cincinnati meeting of the American Gas Light Association we spoke of the personal sacrifice made by President Vanderpool in being in attendance at the sessions thereof. If further corroboratory proof is needed in the premises, we think the same is amply furnished by the information that Mr. and Mrs. Vanderpool sailed for Europe, in the steamship Aurania, on Saturday last.

DEATH OF MR. ALFRED ODIORNE.

We regret to be called upon to chronicle the demise of Mr. Alfred Odiorne, former Superintendent of the Springfield (Ills.) Gas Light Company, whose death occurred at his late residence in that city at an early hour on the morning of November 4.

Mr. Odiorne was born in Woburn, Mass., on August 16th, 1819, and at an early age identified himself with the gas business. He visited Springfield for the first time in 1854, in company with his brother George, they having secured a joint contract to erect a gas works in that city. When the plant was completed, and the operation of same assured of success, the subject of this sketch returned to his Eastern home; but in October, 1867, at the solicitation of the proprietors of the Springfield works, he assumed the Superintendency of the Illinois establishment until relieved by death of all earthly care. Mr. Odiorne was a member of the Western Gas Association. He was a progressive engineer, and an honest, upright man.

DEATH OF MR. F. W. HARTLEY.

The English fraternity of gas engineers has encountered a severe shock in the sudden death of Mr. Frederick William Hartley, late Manager of the famous gas engineering firm operating under the title of Alexander Wright & Co., in Millbank street, London. His death occurred on the evening of Saturday, Oct. 17, and the "snuffing out of life's candle" is attributed to heart disease, over which complaint Mr. Hartley had been a gentle, patient sufferer since April, 1884. Mr. Hartley enjoyed a great reputation among his European brotherhood, and strict truth is adhered to in the assertion that his name and fame were held in almost as great esteem and favor on this side of the Atlantic as they were in his own country.

Mr. Hartley was a most voluminous writer, and his compositions always displayed evidence of research, perspicacity and soundness. His articles on "Cooking by Gas," "Coal Gas as a Fuel," and the "Calorific Power of Coal Gas," are probably those which attracted the greatest attention among American gas engineers; but it is also true that his volumes on "Gas Meter Testing" and "Gas Measurement," also the "Gas Analyst's Manual," have been widely circulated in America. He was an Honorary Member of the Gas Institute. To employ the words of our English contemporary in its initial notice of the death of its valued contributor, "He was an upright, honorable man; respected as a manufacturer, and implicitly relied upon as an experimentalist."

PUBLICATION POSTPONED.

Under the heading of "Gas Governors" (for which see page 236, issue of Nov. 2), it was stated that a fully illustrated description of an "automatic differential gas governor" would appear in this number of the JOURNAL. The description of same is unavoidably postponed until the number for December 2 makes its appearance.

EXPLOSIONS IN MINES.—The causes of explosions in mines and the means of preventing them are to be made the subject of especial investigation by a permanent commission in Austria. The scope of immediate inquiry includes safety lamps, coal dust explosions, meteorological observations, ventilation, and the use of gunpowder for blasting.

[Official Report—Continued from page 230.]

Thirteenth Annual Meeting of the American Gas Light Association.

Held at College Hall, Cincinnati, Ohio, Oct. 21, 22, 23.

First Day—Morning Session.—Wednesday, Oct. 21.

Report of Executive Committee.

The following report of Executive Committee was read by the Secretary. On motion, the report was accepted and its recommendations ratified as the action of the Association.

Cincinnati, Ohio, Oct. 21, 1885.

To the Members of the American Gas Light Association: Gentlemen—Your Executive Committee would respectfully report the following acts and recommendations for your approval:

The hours for holding the sessions during the present meeting to be as follows: Wednesday, meet at 10 A.M.; adjourn at 12 M.; reconvene at 2 P.M.; adjourn at 6 P.M. Thursday, meet at 9:30 A.M.; adjourn at 12:30; reconvene at 2 P.M.; adjourn at 6 P.M. Friday, meet at 9 A.M.; adjourn at 11 A.M.; reconvene for final adjournment at 5 P.M.

Recommended, that the salary of Secretary and Treasurer be fixed, until further action of the Association, at $500, and his expenses in attending the meetings of the Association.

The following papers have been approved: "Natural Gas," by W. H. Denniston; "Stoking Machines," by M. S. Greenough; "Improved Furnaces," by Austin C. Wood; "The Result of a Month's Working with Limed Coal," by James Somerville; "The Thermophote, or Self-Registering Photometer," by T. O'Conor Sloane; "The Present State of the Gas Business," by J. C. Pratt; "Difficulties Encountered in the Construction of a Gasholder Tank," by Emerson McMillin; "Automatic Street Main Governors," by Wm. Enfield; "The Relations of Corporations to Municipalities," by J. B. Crockett, Jr.; "Naphthaline," by J. H. Walker, Sr.

Your Committee, taking cognizance of the fact that we are honored this year by the presence at our meeting of R. P. Spice, Esq., Past-President of the Gas Institute of England, take pleasure in proposing him as an honorary member of the Association.

For the Committee,
A. B. Slater, Chairman.

Report of Finance Committee.

Mr. John Andrew, of Finance Committee, read the following report, which was, on motion of Capt. W. H. White, received and ordered spread on the minutes.

Cincinnati, Ohio, Oct. 20, 1885.

To the Members of the American Gas Light Association: Gentlemen—Your Finance Committee would respectfully report that they have examined the books and accounts of the Secretary and Treasurer, C. J. R. Humphreys, for the year ending Sept. 30, 1885, and find the same to be correct.

Very respectfully,
Jno. Andrew, Wm. Cartwright, } Finance Committee.

Report of Secretary and Treasurer.

Mr. C. J. R. Humphreys, Secretary and Treasurer, here presented the following detailed report covering fiscal and membership statistics of the Association for year ended Sept. 30, 1885:

Receipts.

From initiation fees	$160 00	
" dues for year 1882	5 00	
" " " 1883	25 00	
" " " 1884	120 00	
" " " 1885	990 00	
" " " 1886	5 00	
Sale of "Proceedings"	7 75	
Interest on the funds of the Association	88 60	
Total receipts	$1,401 35	
Cash brought forward from last year	2,263 48	
Total amount to debit		$3,664 83

Expenditures.

Printing of Vol. VI., and postage on same	$772 21	
Expense of Washington meeting	307 70	
Printing, etc.	125 85	
Salary of Secretary and Treasurer	500 00	
Postage, stationery, and sundries	95 48	
Total expenditures	$1,801 24	
Cash on hand carried to credit of next year	1,863 59	
Total amount to credit		$3,664 83

Mem. of cash on hand—

Deposit in South Brooklyn Savings Bank	$1,115 89	
Deposit in Williamsburgh Savings Bank	744 28	
Cash in Treasurer's hands	3 42	
Total as above	$1,863 59	
Due from members, including dues for 1886	1,730 00	

Roll call for the year shows as follows—

Active Members.

Number on roll call Oct. 1, 1884	271	
Admitted at last meeting	16	
		287
Number dropped from the roll	11	
Died during the year	4	
Resigned	2	
Now on roll, Oct. 1, 1885	270	
		287

Honorary Members.

Number on roll Oct. 1, 1884	6
" " " 1885	6

Deceased Members.

Thomas Butterworth	Rockford, Ills.
George Cornell	Youngstown, Ohio.
I. Herzog	New York, N. Y.
Francis Thompson	Charlestown, Mass.

C. J. R. Humphreys, Sec. and Treas.

On motion of Mr. A. B. Slater the report was received and ordered spread on the minutes.

Committee on Nominations.

The President appointed Messrs. W. A. Stedman, G. A. Hyde, Thomas Turner, T. Littlehales, and D. D. Flemming a committee to nominate a board of officers for ensuing year.

Committee on Place of Meeting, 1886.

On motion, Messrs. W. H. White, I. N. Stanley, W. H. Pearson, Walter Wood, and J. P. Harbison were appointed a committee to name a city wherein to hold the fourteenth annual meeting of the Association.

Roll Call.

Calling the roll disclosed the presence of the following members:

Honorary Member—R. P. Spice, London, Eng.

Active Members.

Anderson, John, Ironton, Ohio.
Andrew, John, Chelsea, Mass.
Barret, A. H., Louisville, Ky.
Baumgardner, J. H., Lancaster, Pa.
Battin, Isaac, Albany, N. Y.
Baxter, Wm. H., Petersburg, Va.
Beal, W. R., New York, N. Y.
Boardman, A. E., Macon, Ga.
Blodget, Chas. W., Brooklyn, N. Y.
Bush, John S., New York, N. Y.
Butterworth, Wm. C., Rockford, Ills.
Cabot, John, New York, N. Y.
Clark, Walton, New Orleans, La.
Cartwright, Wm., Oswego, N. Y.
Cartwright, J., Fishkill, N. Y.
Cartwright, Matt, Rochester, N. Y.
Cressler, A. D., Fort Wayne, Ind.
Cole, T. W., Altoona, Pa.
Coggshall, H. F., Fitchburg, Mass.
Collins, A. P., New Britain, Conn.
Connelly, T. E., Pittsburgh, Pa.
Connelly, J. S., Pittsburgh, Pa.
Copp, Austin M., Boston, Mass.
Cornell, Thomas C., Yonkers, N. Y.
Cowing, John H., Buffalo, N. Y.
Coyle, Patrick, Charlestown, Mass.
Curley, Thomas, Wilmington, Del.
Cushing, Oliver E., Lowell, Mass.
Denniston, W. H., Pittsburgh, Pa.
Dickey, R. R., Dayton, Ohio.
Dingee, F. A., Philadelphia, Pa.
Flemming, D. D., Jersey City, N. J.
Floyd, James R., New York, N. Y.
Floyd, Fred. W., New York, N. Y.
Fullager, John, Cincinnati, Ohio.
Fry, Chas. C., Lynn, Mass.
Gates, F. W., Hamilton, Ont., Can.
Graves, Henry C., Dayton, Ohio.
Graeff, G. W., jr., Philadelphia, Pa.
Gardner, Jas., jr., Pittsburgh, Pa.
Geggie, David H., Quebec, Canada.
Greenough, M. S., Boston, Mass.
Gribbell, John, New York, N. Y.
Griffin, John J., Philadelphia, Pa.
Gilbert, T. D., Grand Rapids, Mich.
Goodwin, W. W., Philadelphia, Pa.
Harbison, John P., Hartford, Conn.
Helme, Wm., Philadelphia, Pa.
Hickenlooper, A., Cincinnati, Ohio.
Hookey, Geo. S., Augusta, Ga.
Hopper, Thos. C., Philadelphia, Pa.
Howard, L. J., St. Louis, Mo.
Humphreys, Alex. C., Phila., Pa.
Humphreys, C. J. R., Lawrence, Mass.
Hyde, G. A., Cleveland, Ohio.
Isbell, Chas. W., New York, N. Y.
King, E. J., Jacksonville, Ills.
Leach, Henry B., Taunton, Mass.
Lindsley, Edward, Cleveland, Ohio.
Littlehales, T., Hamilton, Ont.
Loomis, Burdett, Hartford, Conn.
Ludlam, Edwin, Brooklyn, N. Y.
McElroy, John H., Pittsburgh, Pa.
McMillin, Emerson, Columbus, O.
McIlhenny, John, Phila., Pa.
McDonald, Wm., Albany, N. Y.
Nash, C. H., St. Joseph, Mo.
Neal, Geo. B., Charlestown, Mass.
Nettleton, C. H., Birmingham, Conn.
Page, G. S., New York, N. Y.
Pratt, John C., Boston, Mass.
Pearson, Wm. H., Toronto, Ont.

Pritchard, Chas. F., Lynn, Mass.
Prichitt, Sam'l, Nashville, Tenn.
Ramsdell, G. G., Vincennes, Ind.
Rankin, Benj., Louisville, Ky.
Reinmund, Henry J., Lancaster, O.
Robinson, Wm. L., Uniontown, Pa.
Roots, D. T., Connersville, Ind.
Roots, F. M., Connersville, Ind.
Slater, A. B., Providence, R. I.
Smallwood, Jas. B., Baltimore, Md.
Stanley, Ira N., Brooklyn, N. Y.
Starr, Jas. M., Richmond, Ind.
Smedberg, Jas. R., Lancaster, Pa.
Stedman, Wm. A., Newport, R. I.
Stein, E., Philadelphia, Pa.
Spencer, R., Burlington, Iowa.
Smith, Jas. H., Newark, Ohio.
Simpkin, Wm., Richmond, Va.
Somerville, Jas., Indianapolis, Ind.
Taber, R. B., New Bedford, Mass.
Tayler, Geo. H., Warren, Ohio.
Thomas, Jos. R., New York, N. Y.
Townsend, S. S., New York, N. Y.
Turner, Thos., Charleston, S. C.
Vanderpool, Eugene, Newark, N. J.
Walker, J. H., jr., Milwaukee, Wis.
Weber, Oscar B., New York, N. Y.
Wells, Geo. H., Nashville, Tenn.
White, Wm. H., New York, N. Y.
Wood, Austin C., Syracuse, N. Y.
Wood, Gideon, New Bedford, Mass.
Wood, Walter, Philadelphia, Pa.

Pressing routine business having been disposed of, the President announced that reading of papers was in order. Mr. Emerson McMillin, of Columbus, Ohio, thereupon read the following paper, entitled,

DIFFICULTIES ENCOUNTERED IN THE CONSTRUCTION OF A GASHOLDER TANK.

The members of our Association are profited at every session by hearing of the successful experiments and undertakings of their fellow members; but, believing that we may be equally profited by recounting our mistakes and failures, I have thought it advisable to give a short history of difficulties encountered, and mistakes made, in the construction of a tank during the year 1884.

That you may better comprehend the remarks, I present a topographical survey of the ground, also plan and sectional elevation of the tank.

The city of Columbus is located on "drift" formation. The drift deposit is from 60 to 120 feet deep. It is chiefly composed of a greenish blue clay, thickly interspersed with lime boulders. The surface, in many places, is covered with a few feet of gravel; and at a depth of 25 to 40 feet, another seam of gravel and sand is reached.

The plot of ground in which our tank was excavated was barely large enough to contain it, the brick wall on three sides of the tank touching either alley or street lines.

You will notice, by the topographical survey, that quite a depression in the ground existed near the center of the lot. This depression was originally caused by a stream flowing through the grounds, and which had, ages ago, deposited sand and gravel to a depth of 10 to 20 feet. On this deposit, in the lowest place, had been carted earth removed in the construction of neighboring streets and in grading lots. On the south side of the tank, however, was found solid, greenish-blue clay up almost to the level of the streets.

The excavation was commenced on the south side, going down in nearly a semi-circle, and the earth was carted to the north side. Fearing that sand or gravel might be reached before we had attained the desired depth, we carried down a well four feet in diameter (which you will notice is shown in the plan), making this well three feet deeper than the tank excavation. The tank when completed was to be 93 feet 6 inches inside diameter, and 27 feet deep to top of coping stone. A cone, about 10 feet high, and over 60 feet in diameter, was left in the center.

It was necessary to start a steam pump to drain the depression or pit before the work of excavation could be commenced; and from the time pumping was first started, until the brick walls were up, the pump was run constantly day and night, and much of the time it was found necessary to reinforce it with an additional pump or with a steam siphon. A driven well had been put down years ago, just at the periphery of the tank, to which driven pipe was attached a wood pump. On breaking off this pump the water flowed out of the pipe and gave us an artesian well, until a pick struck sand in our new excavation 30 feet deep, when the artesian well suddenly ceased to flow.

The east and north sides of the excavation were "spouty," and after reaching a depth of 12 or 15 feet sliding commenced, and continued until the excavation was completed, causing us much extra labor and expense. As before stated, sand was struck in the well at a depth of 30 feet. This would not permit us to go as deep as we desired. Leaving three feet of clay in the bottom above the sand, our brick wall would be one foot above ground at the southeast side, and six feet above ground at the northwest side of tank. Reaching the full depth on the south, we began removing the graded roadway, and soon discovered, much to our regret, that the underlying sand and gravel laid in rolls, and, in a large section of the tank, reached up through our intended three feet of blue clay bottom. However, the surface of the sand was covered with rather a compact bed of fine gravel, and we did not anticipate any serious trouble in making a tight concrete bottom.

We now found it necessary to bury a drain pipe (shown in drawing) around the entire excavation, putting it about three feet inside of what was to be the inside line of brickwork, and running branches out at a few of the wettest places to the outside line of wall. These drain pipes carried all the water to the well outside of the tank, and in which the steam pump was located. Fortunately we had solid earth where our inlet and outlet pipes entered the tank, and a steam siphon (throwing an inch and a-half stream of water) was sufficient to keep the pit dry while we were putting down these pipes and the drip receptacles underneath.

The specification for constructing the bottom required a 12-inch thick ring of concrete to be put down—the ring to have an inside diameter of 89 feet, and an outside diameter of 101 feet, making the ring 12 feet wide; the concrete to be of broken limestone four parts, sharp sand two parts, and good hydraulic cement two parts, all to be thoroughly mixed dry, and again when wet, and to be put in position and thoroughly rammed down immediately on being wetted. The whole to be, when completed, a solid, compact and water-tight mass. The pier foundations were constructed in the same manner. The remaining bottom of the tank, including cone, was to be covered 12 inches thick with three parts of coarse gravel, two parts of sand, and two parts of good hydraulic cement, to be put down in the same manner as specified for the limestone concrete. The entire surface was to be made smooth and even with mortar composed of two parts sand and one of cement; and upon top of this was to be put a one-half-inch thick plaster of best Portland cement—this to guard against the porosity of the other cement mortar. The limestone was broken so as to pass through a two-inch ring.

The specification for the construction of the bottom was adhered to throughout, so far as the company was able to enforce the contract. Sixteen rest stones, eight inches high and twelve inches wide, were laid on the foundation, projecting into wall 9 inches, and into tank 31 inches.

The original specification for brickwork required the lower section, to the height of 8 feet 6 inches, to be made 34½ inches thick, or the thickness of the length of four bricks; the second section, 7 feet 6 inches high, to be 30 inches thick; the third section, 6 feet high, to be 25½ inches thick; and the fourth or top section, 4 feet 8 inches high, to be 21 inches thick.

After seeing the unfavorable character of the ground, the great tendency of the dirt walls to slide, and the height the wall must project above ground, the dimensions of the brickwork were changed, the sections being 43, 34½, 30, and 27 inches, respectively, and at two points, where no embankment could be made to sustain wall above ground, buttresses were built below the roadway, reaching back to solid earth and up to tank wall (as shown in drawing), the buttresses only coming up flush with sidewalk. In many places at the bottom the walls were built out solid to the bank, giving a thickness, for a short distance, of over 4 feet. The piers were carried up full size from the bottom. The specification required the walls to be built of the best hard-burnt brick; the joints to be carefully rubbed up and slushed full of cement mortar, except the 9 inches back of the front 9 inches of wall, which was to be thoroughly grouted. No part of the brickwork was permitted by the specification to be carried up more than 3 feet above any other part of the wall.

The mortar was to be composed of one part of good hydraulic cement to two parts of sharp sand. The cement and sand to be carefully mixed dry, then again when wet, and to be used inside of half hour after being wetted. Bricks were all wet before being laid. At every three feet in height a ring of one and one-half by three-sixteenths-inch band iron was built into center of wall; and in the northwest section, above the natural surface, these bands were put in at every 18 inches in height of wall.

By the specifications and contracts the walls and bottom were to be absolutely water-tight when completed, and if found not so, they were to be made tight at the contractor's expense.

The tank was completed about the first of August, 1884, and by the middle of following September the holder was completed. The tank was filled with water to a height of 20 feet, and was found to leak badly. The water was pumped out and the Portland cement was found fractured in several places, indicating, as we thought, that the pressure of water below had broken the bottom before a sufficient weight of water could be put into the tank to neutralize the upward pressure, though we had taken the precaution to pump the water from under the bottom until we had four feet of water in the tank. We were now satisfied that the concrete was too porous, and we put on a plaster 3 inches thick all over the bottom (not including cone, which is blue clay), and as an extra precaution against breaking this cement we put in six automatic valves that opened to the pressure from below and closed from pressure above. It was in sinking the 3-inch pipes attached to these valves that we first discovered the treacherous character of the bottom. In places where we expected to pierce three or four feet of clay we would not go down six inches until we would find gravel; while perhaps not five feet from that point we would find the clay four feet thick. With the valves in and the bottom cemented, we again filled the tank two-thirds full, and found it leaking almost or quite as badly as before. The long nights of November were

now upon us, and we were needing the holder badly. Pumping the water out the second time, we determined to put in a bottom that would be impervious to water. Coating the bottom with hot asphalt, we put down three complete layers of roofing felt, each laid in asphalt; next a course of hard brick laid flat and the joints poured full of asphalt; then a course of brick on edge and filled and coated with hot asphalt. After giving the walls a thin coating of cement we filled the tank with water, having confidence that it would be practically tight. We were, however, doomed to disappointment. We had, in fact, improved it but little. By pouring tar down into the water outside of the holder, covering the surface of the water twice each day with sawdust, and then sprinkling dry cement on top of the water to carry down the sawdust, we finally got the tank so it might have been used; but as the then began a regular siege in hunting for weak points. By stopping the pumps for a few minutes the water would surge up at some point, and not by any means always through an automatic valve. While it was easy enough to see where the water came through the asphalt paving, we could not be certain that it did not come through the concrete ten feet from that point. We succeeded, however, in finding several weak places, and it now became a race with us to get these places fixed before the pumps would pump out sand enough to make others. The walls were straight and free from cracks, but the cement near the bottom appeared to be worthless; and when we would stop the pumps the water would gush through the joints near the concrete at one or two points where the wall was four feet thick. We cut out these weak joints 9 inches back, and rebuilt with Roman cement.

Explanation.

Fig. 1.—Plan of Tank.

Fig. 2.—Vertical Section of Tank.

Fig. 3.—Section of Bottom, on a larger scale.

A.—Brick Wall.

B.—Cone of Drift Clay.

C.—Drift Clay Bottom.

D.—Gravel, with Sand beneath.

E.—Sewer Pipe below Concrete.

F.—Well, 3 feet deeper than the Tank.

H.—Automatic Valves.

J.—Concrete of Limestone, Sand, and Cement.

K.—Cement of Sand Plaster.

L.—Roofing Felt and Asphalt.

M.—Brick laid in Asphalt.

N.—Buttresses.

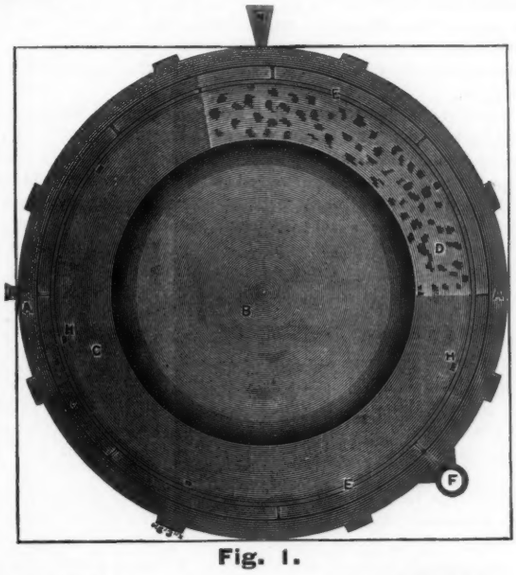
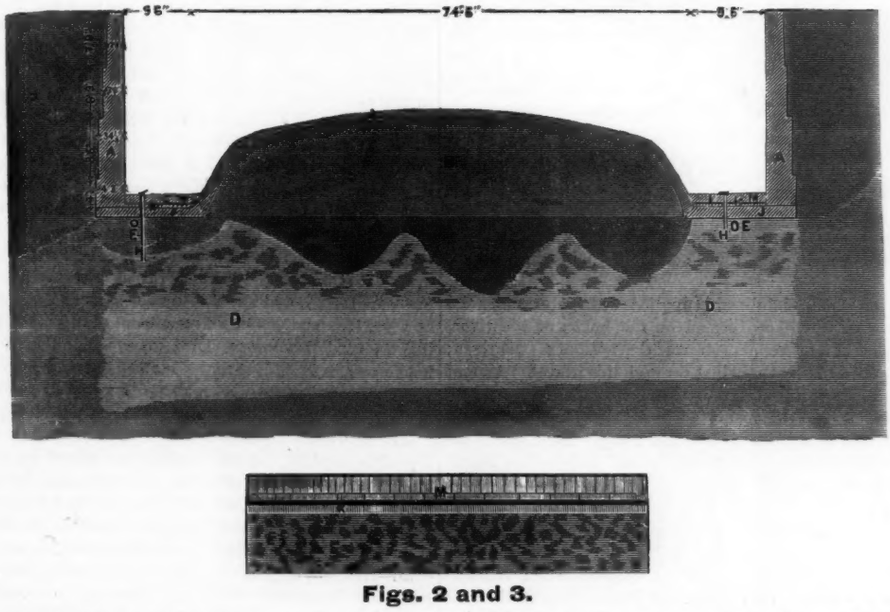


Fig. 1.



Figs. 2 and 3.

nights of heaviest consumption had by this time passed, we concluded to abandon further work until spring.

Feeling quite sure that the incessant pumping, day and night, from the well was probably drawing out fine sand enough to weaken the bottom, and that if the tar could be prevented from reaching the well, it, together with the cement and sawdust, would eventually close up the leakage, we concluded to drive two 4-inch pipes ten feet below the bottom, and then fill up the well solid for eight or ten feet, and thereby cut off the drain pipes. This we did in the latter part of May, 1885. Great was our surprise, however, when we discovered that we were pumping a copious supply of tar and pitch from a depth ten feet below the bottom of the tank. Things now indeed looked serious. Again we pumped the water out of the tank, put in two steam pumps, buried their suctions four feet below bottom of the tank, and At the weak points in the bottom we removed the brick and roofing-felt covering, cut down a little into the concrete, and laid down, in Roman cement, two courses of 2-inch oak plank, the top course at right angle to the course beneath, covered these with pitch, relaid the brick pavement, and after giving the entire brick wall from top to bottom two coats of Roman cement plaster, we were again ready to fill up with water.

The pumps were set six feet above the floor, and the water pumped from beneath the bottom was discharged into the tank; and when the height of water reached the pumps they were disconnected, their suctions plugged, and left in position. The tank was then filled from the water works to a height of 13 feet, and left standing four days, when it appeared to be practically tight. Another 12 feet in height of water was then admitted; with this additional pressure the tank leaked some, but so little that we con-

cluded to put it into use, which we did about September 1st of last year, or almost one year after the completion of the holder.

It would be impossible for you to have a full conception of the numerous difficulties encountered, even after you have heard this brief description of our troubles. Our most serious difficulties occurred during our last effort to repair tank, caused by the pitch that had been used in putting down the asphalt bottom. Sometimes whole days and nights would be spent in trying to get our pumps to work. A pump would be taken all apart and thoroughly cleaned, put together, set to work, and in ten minutes time would again be so clogged with pitch that it would cease to take water. The packing alone for two small pumps would, for days at a time, cost us $2.50 to $3 per day. Hemp packing would be cut and torn to pieces in a few moments, and gum would both cut and dissolve.

I have told you of some of the *difficulties* encountered, and you can doubtless see where *mistakes* were made without my enumerating them. There were three mistakes made, however, that will not be apparent to you without further information.

First, the concrete was not sufficiently rammed. Do and say what we would, we could not get the sub-contractor to ram the material as the specifications required. We were compelled, owing to the sliding tendency of the earth walls, to cover the bottom with concrete as fast as a few feet were graded. In this way the south and southwest sections, after the concrete was put on, received the travel of wagons and carts passing around the cone in removing the earth from other portions of the pit. That part of the bottom was good, compact, and water-tight. Other portions that were not well rammed would, when the plaster was removed, let the water run through like a sieve.

Another mistake I made was in letting the contractor persuade me that more of the wall ought to be grouted than was provided for in the specifications, and less of it made with slush joints. Grouting does not make as good work as slushing, though I know the custom is to grout most of the wall. The excess of water greatly weakens the tenacity of the work; and when the excess is absorbed by the brick there must of necessity be unfilled spaces left in the wall.

The third, and perhaps the most serious, mistake I made was in using Louisville cement. As this cement could be had at one-third the cost of English Portland or Roman cement, we were tempted to use it, thinking the walls could be made heavy enough to stand, and still make a saving in the cost of the work. The samples of cement submitted with bids for doing the work were good, but that used in the wall and bottom was irregular in quality; and it is not possible to test each barrel as the work progresses, as time alone can determine the properties of a cement. In this particular, at least, I advise you not to follow my economical practice.

Discussion.

Mr. Gilbert—Is Mr. McMillin familiar with the operation of the system by which his city is supplied with water?

Mr. McMillin—Yes, sir.

Mr. Gilbert—It would seem to me as though you penetrated the same strata of porous material which gave them so much trouble in getting a water supply.

Mr. McMillin—Our city of Columbus is supplied with water under the Holly plan, and the water works are located on the banks of the river. There is from 10 to 20 feet of a gravel deposit over the bottom of the river; and the water supply is obtained by tunneling through this gravel. A great many tunnels have been driven through the gravel bed. The water percolates through those tunnels, and the result is a good, clear, and cold water supply. The only objection to it is that it is rather limey. That gravel deposit is not identical with the one encountered by us. It is a more recent deposit—it is a river deposit, pure and simple.

Mr. Greenough—I think Mr. McMillin is to be thanked for bringing to our notice the history of his misfortunes. As a general rule the Association's members hear only of the successes which one of their number may achieve; but it appears to me that it is sometimes equally as instructive and valuable to learn of the failures of others. Seemingly, one likes to hear of the misfortunes of other people, because then he can take some comfort in thinking that he is not alone in encountering trouble. As a supplement to the history of his misfortunes, the account of which has afforded us so much pleasure and interest, I may say that some years ago, in the building of a holder, we had in Boston a somewhat similar experience to that narrated by Mr. McMillin. We had water within three feet of the surface of the ground all the time, so that the pumps had to be kept going continually. A consequence was that when the tank was filled with water it was found to leak—the pumps went down below the wall. We pumped out the water from the tank (there was perhaps a foot in depth left around the edge of the ring), but could not then find the source of leak. It was not until all the water had been taken out that we were able to discover the existence of a little crack, under the wall, about large enough to insert your finger. I mention this to illustrate the great danger of pumping too fast while excavating for a tank. If there is any sand that can by any possibility get into the pump, you may pump out a little from under the concrete bottom; then when you put the weight of the water on it, down it goes, and you have a leak.

Mr. McMillin—I think that we escaped the difficulty you speak of by having a drain pipe about 3 feet inside the wall. This drain pipe was laid with a tight joint; and it was along the line of drain pipe that we took the sand out.

Mr. Littlehales—In my experience it is far more satisfactory to make an annular ring rather than remove the entire body of earth. If you leave a central core you have something left to shore up against. Even if you have a shifting character, or alternation of clay and gravel, you have something to hold it there in position. My experience is that the cost of removing the core is more than compensated in the additional security gained from it.

Mr. McMillin—I think that is true; and if I were going to place another gasholder alongside of this I should adopt that plan. We did not anticipate any trouble. We had excavated to the same depth for a tank but 200 feet away from the one under discussion, and had no trouble at all.

Mr. Ramsdell—I wish to say a word with regard to the matter of cement. I think what Mr. McMillin names as his third mistake was the most important one of all in respect to the construction of that tank. In 1881 we put up a new holder. Our soil at Vincennes, Indiana, is a difficult one to build a tank on. We have no clay whatever; it is all gravel and sand. We found, if we were to sink the well to the depth originally intended, we would strike quicksand. Accordingly we stopped at a point two feet above the original plan. I figured in like manner with Mr. McMillin in regard to the cost of the cement; and I did not find that Louisville cement would be much cheaper. The Louisville brand is, of course, a great deal lower in price per barrel; but when it is remembered that the Portland barrels contain a greater weight, and that it is so much stronger, there is really very little difference in the respective amounts required for the work in hand. For instance, in the mortar for the brickwork we could use four parts of sand to one of Portland cement; while, with the Louisville sort, we could only use two parts sand to one part cement. And so also with the concrete. We have a concrete bottom built in three layers of four inches each, thus making a solid depth of one foot. In that work we used a proportion of seven or eight parts broken stone to one of cement. The bottom of our tank is perfectly tight; and the whole tank is tight. On the morning after we finished building it we found the water in the tank had lowered about two feet. I was very much alarmed until I discovered the lowering was due to the absorption of the water by the porous bricks. I think, in the long run—regarding the quantity of cement used in a tank—there is very little difference in cost as between the Portland and Louisville cements.

Mr. Helme—I wish to ask Mr. McMillin whether his faith is at all impaired in the ability of concrete to retain water. I have not a great deal of faith in it. I always put in two or three courses of brick. I do not pay much regard to the quantity of cement used; of itself that is a small matter compared with the failure of a tank. If I had any doubt about my cement I should use half cement and half sand. There is another thing about concrete. Many handle the rubble, mix it upon the bank, and then dump it over. It is well to mix it in the pit, spread it as quickly as possible after it has been mixed, and never disturb it again. I always looked upon concrete as a good foundation—if well made out of brick and proper cement. In fact, it is the kind of bottom I have always found best calculated to stand and hold water. If you skimp your cement and are careless about your sand you may count on having trouble. I would like to know what your opinion is about concrete holding water. Do you put on asphalt and use brick?

Mr. McMillin—I put in two courses of brick. One flat course was laid on top of the asphalt, the other course was placed on edge on top of the first, and then three courses of roofing felt were laid over all.

Mr. Helme—When that was done your tank retained water?

Mr. McMillin—It leaked a little worse than it did before we put it on. (Laughter.) It did not seem to make any difference.

Mr. Helme—We built a tank last year, and came very near dumping the purifying house into the hole. We had to work quite lively for a while. We struck quicksand, as you did, on one side. In order to get around it we collected some round stones, each four or five feet in length, and put up a derrick. At the point that bothered us so much we took the sand out and dumped the rocks right in on top until we got a wall strong enough to keep the quicksand back. We went all the way around until we closed the thing in. As we had four feet diameter, on the inside, wherein to build the wall, we put down a good tank, and it holds water very well. We put down four courses of brick, care being taken not to lay any two courses so that the seams would be parallel. When the brickwork was completed it was all coated over with cement. We found it answered very well indeed.

Mr. Harbison—I have not a particle of faith in the contract system of building tanks, and I think Mr. McMillin's greatest mistake was in having the work done by contract instead of under his personal superintendence. I

allude to it now in order that members of the Association, who may by and by build tanks, will not fall into such mistake. At Hartford, Conn., we had an experience quite similar to that detailed by Mr. McMillin, and the teaching of the experience was such that we do ot want any more tanks built by contract. We are perfectly willing to have the holder built by contract, but not the tank. I think if he had done the work himself he would not have been so unsuccessful. That was his mistake.

Mr. Beal—It will not do to give all contractors a black eye. In 1884 I built a tank, and three-fourths of one side of the excavation was in solid rock formation. The remaining fourth was in quicksand. The job was given out by contract to the lowest bidder; but we were careful to note that the contractor did his work. It was completed in October, 1884, was filled immediately afterward, and has had no water in it since. So, I beg to say a good word in behalf of the contractor. I might say, in addition, that Louisville cement was not used, neither was Portland cement employed. I have no hesitation in saying to the gentlemen present that a good cement is to be found in the Hudson River district—I refer to Rosendale cement. It will, without any doubt, make a good tank every time.

Mr. Spice—It strikes me that my long experience in tank building may perhaps be worth something to you. I will state it very briefly. Experience has led me to the conclusion, primarily, that the safest way to take hold of a job of that sort is to first dig an annular space. Let that space be timbered, and kept vertical all the way down by means of cross timbers and curbing. Then you have it entirely under your control. Then I begin with a bed of concrete. And, with regard to the different kinds of cement, my simple rule is always to use the best material of every kind that I employ. If I go to a tailor I get the best suit of clothes that he can give me, because I believe that the best is always the cheapest in the end. That principle will apply to everything pertaining to gas apparatus and gas works construction. Get the best of everything. I begin by getting my concrete in, being careful to have a good, large space, even if it be considerably larger than is absolutely necessary. On the center of that I commence to place my bricks, and have determined that the bricks should be laid longitudinally. I lay a ring of stretchers, not all around the tank, but close to the circular row of stretchers. Outside of that I place a circular layer of firebrick. I begin with brick that are $9 \times 4\frac{1}{2} \times 3$. Outside of the inside layer I put another row of firebrick; then another layer of 3 inch; and so on, or as wide as I want the base. Then I put on the inner ring another layer of 3-inch brick; and on the row beyond the second row of firebrick a 3-inch brick; then firebrick; and then 3-inch brick again. Then a 3-inch brick on top of the first one; and a 3-inch on the second—not the second tier, but beyond the firebrick. In that way I get a groove. I put into that groove some stiff cement—so stiff that it would just run out of an iron bucket. I run in a quantity of cement, and upon that I bed my next course of 3-inch brick. In accordance with that plan I go all the way up. I keep on laying brick so as to form a channel, into which I pour the cement; then I have only to build on the inner ring, and on the outer ring, with the aid of a trowel, spread the cement and bed the bricks in the ordinary way. All the way through the course I keep on forming channels. The idea is to prevent any single joint being connected with another single joint. Every joint is broken vertically, horizontally, and lengthwise; and then these divisions are so many walls of cement; so that no water can possibly run straight through. The firebrick, to begin with, are laid, not so as to fill the groove, touching brick to brick, but so as to leave a margin of half an inch; so that there are so many cells, making so many walls of cement dividing those brick walls. In that way I found I could get the best results over any other plan that I have ever tried—and I may add I have tried all. The conclusion I came to is that the safest way of building a tank is by stretchers; no single joint being connected with another joint, and continuing on in that style all the way up, finishing out, of course, with flat work at the top.

Mr. King—I think it does not always follow that the most expensive way is the best. In the experience of our company, gained before my time, however, while excavating for a tank, they encountered quicksand. After resorting to all manner of expedients in attempts to overcome the difficulty—meeting with failure in all of them—they were about to abandon the job, when my father suggested they commence to wall back to the blue clay and puddle. The scheme was successful, and the tank is, I think, as tight to-day as any other tank in the country. Yet at one time a very serious question with them was how to overcome the quicksand difficulty.

Mr. Lansden—Some 20 years ago I made an excavation for a tank which was almost all in sand. We could drive the well down 150 feet. I made the excavation at a time when the water was in the ground, and kept it down by pumps from the outside. I laid a series of tile from bottom of the tank to the center. Over that I laid oak plank, 12×3. I broke the joints, and put a crosswise covering of planking of similar thickness, leaving only an open space, where my pump was placed, in the center. On top of the planking I laid two courses of brick with Louisville cement. I then placed a 1½-inch pipe in the central opening and kept on pumping the water up. I built an arch around the pipe and filled in with cement, keeping the pump running, and had everything complete and ready so as to let the water in when we stopped pumping. I let in about one foot depth of water, disconnected the pump, and put the cap on. I never had any difficulty at all with that tank. I like the Rosendale cement because it sets so quickly.

Mr. McMillin—It will not set half as quickly as the Portland article.

Mr. Lansden—I have used Portland cement but very little.

Mr. Clark—Recently I read about the experience of a former Superintendent of the New Orleans (La.) Gas Light Company, gained while building a holder. The soil there is alluvial with quicksand below. He had almost reached the bottom when the quicksand began to pour in. He drove sheet piling down—do not remember to what depth. He got it finished one night, but the next morning he had three feet of sand there. He tried it again. Then the sheet piling that had been driven down began to rise. Bricks were hauled in and placed on top of the piling until there was a ton of weight to each foot. This kept the piling down, but still the sand was coming up, and the ground was lowering outside. The earth seemed to be seeking its own level. The tank structure was finally accomplished by taking out 20 feet at a time all round, and starting a man in with concrete the moment a particular section was ready. When a section was secured the sand did not give any trouble. No wall was built until the whole thing was bottomed. Putting in the concrete saved it. In the meantime, the diameter of the tank had been diminished by 14 inches. That tank never leaked. The water in that locality stands in the soil at a point within three feet of the surface; but after the tank was finished not a drop leaked in.

Mr. Thomas—I do not think, as a general thing, that the great difficulty in building tanks lies so much in the walls as it does in the bottoms, although I fully agree with everything that Mr. Spice has said in relation to their construction. A short time since I was called on to examine a tank which had been built in a wet, mucky place, and the tank bottom had been covered with only seven inches of concrete. Under the concrete a 10-inch pipe had been run in from the well on the outside of tank, extending under the wall three or four feet into tank. The well was on the side of a hill; and I suppose the point where the well discharged over the surface was probably ten feet below the tank coping. After the tank was built they pumped the water from well into it. The pipe leading from tank into well was about six feet above the well's bottom. When they commenced pumping the water over into the tank it was drawn from the bottom of the well; and as they progressed with the pumping sand made its appearance. In fact, they were simply pumping out the bottom from under the concrete. They had a sort of "perpetual motion" going on. After they had pumped the water up above the orifice of the well, of course, the fluid ran out. On taking up the tank bottom the mason work, concrete, etc., was found to be completely honeycombed. The water was running everywhere under it. After the bottom was made good, the pipe was plugged tight on the inside, and then water was pumped into the tank—care being taken to raise the pipe in the well so as not to pump from under the tank. After filling the tank with water this time it proved all right, and I think it is to-day as tight a tank as may be found in this country.

Mr. A. C. Wood—I have had some little experience in building gasholder tanks, having built several at our Syracuse (N. Y.) works, and have also done similar construction for other gas companies. I have in all cases succeeded in making a good job. One of the most important points is, as Mr. Spice remarked, to use good material. I once built a tank for a 100-foot gasholder, where the inside tank was 103½ feet, with about the dimensions Mr. McMillin spoke of in his specification. The ground was lower by 15 feet on one side of the lot than it was on the other. The excavation was in the bed of an old water-course. I had a good foundation until I began to approach the bottom of excavation, which was, of course, in gravel and boulders. As we uncovered the water came up in large quantities all through the bottom. It was not, according to the nature of the situation, expedient to there excavate an annular space; but I intended to leave a cone in the center about 15 feet high. We got it down to 6 feet, when along came a very rainy season, and the water almost flooded us at times. We were then obliged to suspend excavating and commence on the brickwork. I had about six feet head of water coming up from this gravel to counteract; and it would flow up to the six feet level in half an hour. Having plenty of boulders and cobble stones at hand, I built a wall to the outside of the work. That kept us free from the water. We put in the bottom concrete in four courses, each course being three inches thick. We built brick walls. About every seventh course we had a solid brick wall, with inside and outside courses of brick laid in mortar with tight joints. The bricks were pounded close together and grouting placed between. Nothing but square bricks were laid. Every course of brick was inspected—not only on the contract jobs, but also on our own. In that way we got a water-tight tank. I have succeeded in building tanks in that way without any trouble. I remember building a small tank on the side of a hill having a clay bottom—the blue clay being about two feet thick on top of the quicksand. The

water-course was at the foot of the bluff. We experienced some little difficulty there. If you can only confine quicksand you can build upon it as well as upon any other foundation. Another important point to be considered is the proportion of the material used. Mr. McMillin and several other gentlemen speak of using one-half hydraulic cement. I think that we are very apt to make our mortar too rich, and to depend too greatly upon the virtues of the hydraulic cement. We have a very good cement with us, and I have always used it in building our tanks. We employ what bricklayers usually term a "third," but it is really a "quarter"—one part of hydraulic cement and three parts of sand. With that we have always succeeded in getting a tight job.

Mr. Boardman—I have a great deal of faith in concrete holding water. I built a reservoir holding 2½ millions gallons of water, and lined it entirely with concrete. There is not a single break in it; it is as tight as can be. A roadway has been cut through the land within less than fifty feet of that tank, the roadbed of which is about three feet above the bottom of the reservoir; and in that roadway seldom is there seen any water leaking through. There is nothing but concrete in it; and the concrete was composed of one part of cement to four parts of gravel and sand.

Mr. Stedman—Lest some of our new members might be discouraged by hearing of the hardships the older members have been through in excavating and building tanks, I want to say that we put one up at Newport, R. I., thirteen feet below tide water, the base of brickwork being 20 inches thick, whilst the least thickness of same reached 16 inches. The tank was 102 feet six inches in diameter on the inside, and the bottom was covered with 8 inches of concrete. That was all the work that was done on it. It was perfectly tight from the first. In that excavation the annular system would hardly do, because we had to blast through about sixteen feet of solid rock. I suppose that even Mr. Spice will admit that the annular system of excavation would not have done there. I want to say with regard to the statement made just now about the absorption of water by brick, that we put cement on the surface of the bricks to prevent them from absorbing the water. The mason who built the tank for me had had quite an experience in building such work, but he insisted on putting two courses of bricks on the bottom, else he would not guarantee the tightness of the tank. I said if he would omit the bricks I would guarantee its tightness. I knew the quality of the cement was good, and there was no doubt it would be tight. Some one has spoken about water in a tank lowering two feet by reason of absorption of the fluid by the bricks. I should have suspicion regarding bricks of that sort.

On motion of Mr. Thomas, the thanks of the Association were tendered to Mr. McMillin.

[To be continued.]

The Formation of Coal.

According to the London *Journal*, Prof. Williamson, of Owens College, Manchester, England, on date of Monday, October 12, lectured (before an audience assembled in Palatine Hall, Lancashire,) on the above-named subject. The lecturer commenced by expressing his intention of placing before his audience the leading features of coal, so far as the present knowledge of it extended. He said they should remember that the rocks which they found in and about Lancashire, whether in quarries or elsewhere, were brought into their present position by the action of water. The transporting power of water to carry substances was entirely dependent upon the velocity of its motion—that was, when it had to deal with materials of the same relative weights. Coal was, however, something more distinct than those deposits from water—more than a mere accumu tion of substance inorganic in origin. Long ago geologists knew that coal was of vegetable origin, and they could take this for granted; for if they found fragments of what had been leaves now converted into coal, they could readily understand heaps of leaves being converted in the same way.

They would now try to learn how coal reached its present position. Coal-seams were found parallel to each other, with layers of rocks—it might be of shale or sandstone—between them. In Lancashire the coal seams belonged to the carboniferous series, and lay beneath the red sandstones of the vale of Eden and Cheshire, and above the limestone rocks of Craven and Derbyshire. Coal might be formed at any period of the world's history, but the great bulk of it belonged to the carboniferous age. How, they might ask, did the beds of coal assume their present position, and what had been the changes the vegetable masses had undergone. In the early part of the present century it was observed that the Mississippi, like other large rivers, overflowed its banks, covering vast areas of forest land, and depositing a large quantity of vegetable matter in the Gulf of Mexico, which would gradually become coal. Nothing was more natural than to suppose that what was taking place then took place also in bygone times; and that coal beds were so accumulated. But a serious difficulty arose with regard to this; for the vegetation brought down the rivers in that way must have accumulated in irregular lumps, very different to the way in which coal seams were found—some, perhaps, being only six inches thick, and extending over hundreds of square miles in an uninterrupted course. It was thought that coal beds had been produced like peat; but, although this was not strictly true, there was no doubt that coal had been formed where it was still found. The latter fact was discovered by Sir William Logan, who noticed, while working in the South of London, that, wherever a bed of coal was found, there was beneath it a bed of blue clay of remarkable appearance, crammed with remains of plants called stigmaria. The next step in the solution of the problem was made during the construction of a railway from Bolton to Manchester, when, from discoveries made of forest trees, it became clear that this clay was a soil in which forests of these stigmaria trees grew. These trees threw down year by year masses of decaying vegetation, which, perhaps in the course of vast ages, had become coal.

The next question was how coal seams were formed in layers one above another. The lecturer then explained the depression of parts of the earth's surface (thus letting in water), the production of other layers of clay, and the consequent formation of other beds of coal. With regard to the changes this mass of vegetable matter had undergone to convert it into coal, they had to come in contact with chemistry. A chemical statement was made of the amount of hydrogen, carbon, oxygen, and nitrogen contained in wood fiber, Irish turf, Cologne lignite, Wigan cannel, Newcastle, Harley, and Welsh anthracite, in which it was shown that, although the quantity of hydrogen in all remained about the same, the carbon gradually increased, and the oxygen and nitrogen diminished, as they proceeded from the wood fiber to the anthracite. The great change that took place in the formation of coal was the escape of the gas and the increase of carbon. Speaking of the greater heat as they went lower into the earth, the lecturer said it could be accounted for by the great pressure from the outside; and thus this vegetable mass subjected to high pressure and temperature would change its appearance. Allusion was then made to the examination of coal under the microscope; and the lecturer dwelt at some length upon the different plants that had been found in coal. Included in these plants were the club moss, a detailed account of the structure of which was given; the fern, the conifer, and plants now only found in watery or marshy places, and forming the only known instances of fresh-water deposits in the coal of the present day. The ferns that were found in coal grew, he said, in many cases like the tree ferns which are now found in Australia, New Zealand, and other places, and the appearance of of them had never changed. Although he had been engaged for fifteen years in the study of plants found in coal, there were still large numbers of things of which he could not make out anything, but which he had no doubt would be discovered in time. Although very few plants were now brought to light below the Devonian system of rocks (and, according to Darwin, there must have been a vast array of vegetable life of lower origin yet undiscovered), it did not follow that, because they were not yet discovered, therefore they were not there; for he hoped that as they were now finding out new plants and new species, this would still more be carried out before many years had passed. Taken on the widest scale, the whole system of flora throughout the entire world seemed to sustain the theory of evolution propounded by Darwin.

Poisoning by Illuminating Gas.*

The *Sanitary Engineer*, in issue for November 5, explains that this is the inaugural thesis of its author, and is a very excellent *resume* of what is known with regard to poisoning by illuminating gas, to which is added the results of a number of experiments made by Dr. Bruneau upon the manner in which it produces death, and other experiments on the action of propylene upon animals.

The first chapter is devoted to the chemical composition of illuminating gas, giving the results of numerous analyses of the gas of different cities, and of that manufactured from different sorts of coal.

In the next two chapters Dr. Bruneau gives in detail the description of various experiments to determine the action of propylene, one of the constituents of illuminating gas, upon animal life. He shows that this gas is without poisonous action; in fact, in one of his experiments a guinea-pig breathed for some time a mixture of 25 per cent. oxygen and 75 per cent. propylene without apparent injury. The effects of the other constituents of illuminating gas are discussed, with reference to their poisonous effect upon animals, and it is shown that the only one of any importance, from this point of view, is carbonic oxide. This gas is present in illuminating coal gas in proportions which vary between 5 and 13 per cent. It adds little to the illuminating power of the gas, and one of the questions in practical hygiene is to find some means to remove it from illuminating gas without incurring too great cost. It has been suggested that this may be done by passing the gas through a solution of the proto-salts of copper.

[The fact that some of the "illuminants" in the gas are also absorbed by

* Empoisonnement par le Gaz de l'eclairage, par Paul Bruneau, 99 pp., 8vo. Paris: G. Carre, 1885.

proto-salts of copper would make the carrying out of this suggestion quite impracticable, even if there were no other difficulties in the way.—Ed.]

The presence of about one-half of one per cent. of carbonic oxide in air is sufficient to kill animals. Paralysis and other grave symptoms appear when the proportion is only one-tenth of one per cent.

Accidents due to illuminating gas may be caused either by the escape of the gas into the soil in the vicinity of the house from leaks or breaks in the street mains, or to openings in gas pipes in the house itself. When the leak is in the street it may penetrate the soil for long distances and be drawn into houses in cold weather through the cellar floors and walls by the aspiring force which the column of warm air within the house is constantly exerting through these surfaces on the gas contained in the surrounding soil. A very important point to be noted in this connection is, that in passing through a considerable distance in the earth illuminating gas loses all, or nearly all, of its characteristic odor, and thus it may be present in dangerous quantities without its presence being suspected. This fact has been observed in a number of instances, as, for example, in a case in Breslau where the gas had traveled 35 meters through the soil; there was no odor in the house, and the presence of the gas was doubted by the employees of the company.

Following the analyses of Biefel and Poleck, the statement is made that gas escaping under such circumstances shows that the hydrocarbons have disappeared in the proportion of 50 to 75 per cent., that the marsh gas is diminished one-half, the tarry vapors have been condensed and retained in the soil, while the carbonic oxide is found in somewhat relatively greater proportion than in the gas in the mains. After a time the soil becomes saturated, and if the leak goes on for several days the odor may become perceptible.

Accidents from illuminating gas are usually produced in cold weather—most frequently in the months of December and January—this being partly due to the aspiring power of warm houses already referred to, and partly to the fact that the gas does not readily escape upward through frozen soil. It is at this time of the year, also, that the most gas is consumed, and the gas issues from the gasometers at the works under much greater pressure than it does in summer.

The characteristic symptoms of poisoning by illuminating gas are those of poisoning by carbonic oxide. When the proportion present is small and the inhalation of the mixture goes on for some time, as may be the case for several days when the odor of the gas is not perceptible, the symptoms may be very much like those which occur at the beginning of an attack of typhoid fever. If illuminating gas is breathed pure, or nearly pure, the effects are almost like those of lightning—the person falls powerless and unconscious; he does not give a cry, and cannot open a window or break a glass to obtain fresh air. When diluted with air it sometimes produces vomiting and congestion, and is followed by paralysis, which, in the case of recovery, may last for a long time.

The work closes with the report of a number of cases of poisoning by gas, the regulations for gas lighting in Paris, and a very badly edited bibliography of the whole subject.

ITEMS OF INTEREST FROM VARIOUS LOCALITIES.

Gas Matters in Long Island City, N. Y.—Mr. Chas. A. Kittle, General Manager and Superintendent of the East River Gas Light Company, of Long Island City, reports that the alterations and improvements to plant of company have been completed, and adds that the corporation is now in position where it can meet any demand likely to be made upon it by the gas consumers of the locality. About a twelvemonth was occupied in perfecting and carrying out construction details, and the work was thoroughly performed. Among the various things accomplished we note the following: A telescopic, non-trussed holder (with eight wrought iron columns) having a calculated capacity of 200,000 cubic feet, was put up by Messrs. Deily & Fowler, proprietors of the well-known Laurel Iron Works, with shops at Philadelphia, Pa. The tank excavation was made through a tough specimen of rock, but Messrs. Rowland & White, of Jersey City, N. J., are adepts in the matter of excavating for and building holder tanks, and their art did not forsake them at Long Island City. Manager Kittle should, and quite likely does, feel safer now than was the case with him some five or six years ago—or when he first assumed charge of the plant—as at that period he was obliged, for about three months, to supply gas to consumers without employing a holder at all. There was a nominal apparatus of that sort on the works, but it was better calculated to answer the purposes of a sieve than to store gas. The second item is a new purifying house, $36' \times 68'$, and fitted up in the most complete style. Under the same roof is to be found the station meter room, in which an 8×8 meter was put up by the American Meter Company, of this city. The meter carries a "tell-tale," and the finish of the apparatus reflects great credit upon its manufacturers. One of Messrs. Connelly & Co.'s automatic governors has also been installed, and Mr. Kittle is perfectly satisfied with its action. The water supply of works is derived from a six-inch artesian well, driven to a depth of 100 feet, and capable of supplying close to 60,000 gallons every 24 hours. The main system has been increased by the burying of over five miles of conduits, diameters of same ranging from 12 to 16 inches. The new plant went into duty on Friday, Oct. 16th, and no hitch of any sort occurred. The company is now equipped for an output of, say, one-half million cubic feet every 24 hours; and we hope that Mr. Wm. Steinway, the enterprising owner, or chief controller of the financial portion of the corporation's affairs, and Superintendent Kittle, as well, may shortly encounter that 24 hours when the maximum duty of the plant will be needed to meet the requirements of the gas consumers. In dealing with new consumers the manager offers to put in services, set meters, and make connections without charge for same. [The owners or managers of the smaller companies throughout the country might do well to make a note of that practice, for be it remembered Long Island City is not metropolitan in its proportions as yet. At any rate, it will not be the fault of her gas suppliers if her growth be retarded, since they are anxious to do what is right and fair by the people of the place in so far as the important questions of sufficiency and cheapness of artificial illumination are concerned.] The charge for gas to users of least quantity is scheduled at 20 cents per hundred cubic feet. We believe that a scale of discounts is in vogue there, but are not posted as to the figures. Take it all in all, the East River folks are to be congratulated upon the enterprise displayed, and there can be small doubt about the fact that substantial pecuniary return will be their just recompense.

Another Reduction in Price of Gas at Toronto, Canada.—Mr. W. H. Pearson, Secretary of the Consumers Gas Company, of Toronto, has been authorized by his directors to give notice of another considerable reduction in the selling rates for gas in that city. It has been the policy of this company, or at any rate, from about the date of Mr. Pearson's accession to the Secretaryship, to share with its patrons its success in business. We believe the financial year of the Toronto company terminates on the 30th day of each September, and an examination of the accounts for 1884–5 disclosed such a satisfactory balance that it was determined this time to make a more than ordinarily liberal annual concession. In accordance with such determination, on date of November 3d, the following notice was published—prices being, of course, in quantities of one thousand cubic feet—the scale to take effect on quantities supplied from 1st day of last October:

	Gross.	Net.
To consumers of under 200,000 cu. ft. per annum....	$2.00	$1.25
" " over 200,000 " " and under 500,000, 10 cents additional discount.....		$1.15
" " over 500,000 cu. ft. per annum, 15 cents additional discount.....		1.10

The additional discount to both classes of largest consumers to be applied at the end of each year, or September 30th. Gas supplied to cooking stoves, engines, etc.—registered on separate meters—is scheduled at a gross figure of $2, but the discount allowed on same, in consideration of prompt payment, makes the net price equal to *one dollar* per thousand.

In January, 1877, the all round charge for gas in Toronto was $2.50 per thousand, a pretty heavy meter rent being also charged. This latter has been entirely done away with, even in those cases where gas is used for other purposes than lighting. In addition to the decreased charge, the Toronto consumers are in receipt of a gas that will average fully 25 per cent. higher in illuminating value than the article supplied in 1877. It is needless to say that this is progress, and there is not a gas maker in the United States who requires to be told that gas (to the user of the smallest quantity) at $1.25 per M., at any point or locality of Canada, is cheap, and very cheap at that. Indeed, such result could only have been brought about by careful, judicious, and intelligent management. We understand the managers of the Toronto plant are making provision for a great increase in business, by the erection of large and improved apparatus, and we imagine the anticipation as to output will be more than realized. Truly, Mr. Pearson is "a man of business."

Gas vs. Electricity in the State Capitol Building and Grounds at Madison, Wis.—One of our correspondents residing in Madison, Wis., informs us that Governor Rusk, acting under the provisions of chapter 145, laws of 1885, has recently devoted much time and consideration to the subject of lighting the capitol building and grounds. [It may be here explained that Madisonians are justly proud of their State House—a beautiful stone structure erected at an expense of one-half million dollars.] The law provided that electric lighting be employed in case it could be done cheaper than gas could be contracted for. Propositions were submitted from four electric light companies, but only two were sufficiently definite whereon to

make an estimate of cost. Under one of these it appears that the annual cost would approximate to the following:

Western Edison.

Cost of plant	$19,960
Five per cent. interest on plant investment.	$998.00
Seven per cent. wear and tear	1,397.20
200 tons coal	1,248.00
Labor	1,200.00
Oil, waste, etc	290.00
Breakage	905.00
Total	$6,038.20

The other reducible proposition footed up as follows:

Brush System.

Cost of plant	$16,187.50
Interest at 5 per cent	$809.37
Wear and tear	1,133.12
Labor	1,200.00
Fuel	1,248.00
Oil, waste, carbons, etc	1,195.00
Total	5,585.49

The Madison City Gas and Coke Company, in competition, made a proposition to furnish gas in quantities aggregating two millions cubic feet per year, which will adequately light the building and grounds, at the rate of $1.75 per thousand cubic feet, without charge for meter rents. Of the three propositions it is quite easy to determine the one most advantageous to the interests of the State, since the gas supply would cost annually but $3,500, or show a saving of close to $2,100 per annum over the cheaper of the above itemized propositions of the electrical promoters. Our correspondent further adds that, "besides being more economic, the use of gas is certainly the more convenient, and its continued employment means the saving from disuse of all the valuable fixtures and connections with which the building is equipped. In the above estimates as to probable cost of installing an electric service a large sum that would have to be expended in extending coal vaults, enlarging boiler and engine rooms, defacing building, etc., are not considered. In fact, careful calculators agree that cost to put in a complete system of electric lighting would not fall far short of $28,000." If the provisions of the law governing the lighting of the Wisconsin State House are regarded, it is hard to see on what basis (supposing the above to be lowest figures which they can present) the electrical promoters rest their hopes of ousting the Madison gas men.

Doings of the Sioux City (Iowa) Gas Light Company.—Within the past five years the population of Sioux City has almost trebled in number—from 7,000, in 1880, to over 20,000 in 1885—and this rate of increase obliged the directors of the gas company there to be up and doing. Last spring the gentlemen in charge authorized Treas. and Supt. Kellogg to "put their house in order," and some short while back Brother K. reported back to headquarters that he had, among other things, in accordance with instructions, erected a new purifying house, 26′ × 35′, and equipped the same with four cast iron boxes, each 6½′ × 11 feet; a new bench of sixes, heated by improved furnaces; a new Connelly & Co. 8-inch automatic governor, with 6-inch by-pass; ending up, as far as the manufacturing plant was concerned, with a general overhauling of connections, etc. Distribution facilities were increased by the addition of three miles of cast iron mains, and those already in use were carefully examined at all doubtful points. With these matters attended to Supt. K. and his brother officers are ready to vanquish the darkest afternoon and evening that will visit Sioux City during wintriest days of '85 and '6.

Electric Wires Did not Cause the Fire in Steamship Waesland.—In our item columns of issue of Oct. 16th mention was made of a slight fire that occurred aboard the steamship Waesland during one of her voyages between Antwerp and New York. It was there said that electric lighting wires were responsible for the damage which ensued; but subsequent investigation proves that statement to have been an error. The chief officer of the steamer (the Waesland left this port for Antwerp on Saturday, Nov. 7th) informed the writer that the vessel was lighted by oil lamps and sperm candles; that electric illumination had never been employed on board; and, finally, that electric appliances were not used in connection with the ship's steering apparatus. He seemed decidedly averse to making any mention of the real cause of fire; and, in fact, did not openly admit that such an untoward event occurred. The item on which we based our remarks was forwarded in the regular way by a correspondent who is a thoroughly straightforward and reliable gentleman; and in answer to our query regarding the source of his knowledge, he explained that his informant in the premises was the American *Exchange and Review*, published in Philadelphia, Pa., and everywhere recognized among the insurance men of the United States as a standard authority on their business.

There is no Mistake in This Case.—An exceptionally severe southwest storm of wind and rain visited this section on date of Thursday, October 29th, and, as is the usual experience during the progress of such visitations, the electric lighting wires were more or less disturbed. No accident of any moment is reported as having occurred in New York city, where great vigilance is exercised by the electrical promoters in looking closely after service conduits; but in the sister city of Brooklyn a different state of affairs is reported. The premises Nos. 43 and 45 Fulton street are occupied by a tailor, named Rosenberg, and this tradesman maintains an arc light in front of his show windows. At about 11 o'clock on the night above noted the canvas awning over sidewalk took fire, and a passer-by climbed up one of the awning frame poles with the intention of extinguishing the blaze. He made his way to the desired spot, and, possibly to prevent a stumble, seized hold of the object nearest him, which happened to be the electric conduit feeding the carbon below. The shock threw him down, and he fell in such a manner that his arm rested on the wire. When rescued the sufferer was unconscious, his arm was badly lacerated, and blood was gushing from mouth and nostrils. He was removed to the Long Island College Hospital, but the injuries received were so great that his death ensued on the evening of the following Sunday. Deceased was identified as Michael Clifford, of No. 5 Hicks street, Brooklyn. An examination of the wire showed that, as a consequence of chafing, the insulating material had worn thin, and the action of the elements completed the rupture. The damage done to premises was slight. On the same night the wooden framework of a show window at building No. 255 Fulton street was set on fire in similar manner. The damage was slight. Other trifling accidents were also reported. There can be no doubt as to the necessity of speedy action in the matter of enforcing the underground placing of electrical conduits; and despite the appointment of commissions to determine how best the work can be accomplished, we seem now to be almost at a greater length than ever from a probable solution of the difficulty. The stormy periods sure to be witnessed during the coming winter and spring seasons may be counted on to once more emphasize the evil of attempting further procrastinatory legislation. The dangers are admitted; the remedy is evident.

Cottage City, Mass., will Probably have a Gas Company.—Cottage City, Marthas Vineyard, wants a gas company, and it is said that attempts are now being made to secure the desired capital. We understand that about $10,000 will be sufficient wherewith to start the enterprise on the scale proposed.

A Combination Among the "Carbon Point" Manufacturers.—A despatch from Pittsburgh, Pa., says that the manufacturers of carbon points held a meeting at the Forest House, Cleveland, Ohio, on Thursday, the 29th ult., the object of the conclave being the formation of a "protective association." Beyond the mere statement that while they confessed business was decidedly active during the year, and plenty of "points" were disposed of (it was asserted that such sales were owing to the closeness of competition, unproductive of profit), and that the question of advancing rates were about the principal topics discussed at the "convention," we are unable to give precise details of the action taken.

Change of Official Designations.—Hereafter Mr. E. McMillin will be officially known as Engineer and General Manager of the Columbus (Ohio) Gas Company; Mr. Wm. Enfield becomes Superintendent of Works; and Mr. Fred. J. Day assumes the duties of Superintendent of Distribution.

New Gas Company.—A gas company has been chartered to operate in the town of Charlotte, Mich. Charlotte is the capital of Eaton County, is located at the junction of the Chicago and Lake Huron and Grand River Valley Railroads, and is about 59 miles east of Grand Rapids.

Natural Gas at Toledo, Ohio.—Capitalists in the vicinity of Toledo, Ohio, are interested over the natural gas question, although it cannot truthfully be claimed that much practical encouragement has as yet been vouchsafed them through the success so far met with. The chief boring operation developed gas when at a depth of between fourteen and fifteen hundred feet, but the flow was far beneath the expectations of its owners. The output was probably close to 40,000 cubic feet each 24 hours. This result, however, does not seem to have disheartened the prospectors, since they have determined to sink another well at a point about two miles south of the one above mentioned. The new location is on the line of territory in which the Findlay and Bowling Green wells are situated.

Personal.—Mr. Adam Weber, proprietor of the Manhattan Fire Brick Works, New York city, has returned from his European trip much improved

in health. During his stay in Europe he was the recipient of many courtesies, among which we may note a dinner given for his entertainment by the Continental Association of Gas Engineers. The festive event was celebrated in Munich.

IT WAS A WORK OF NECESSITY.—Police officer M. J. Casey, of this city, on the afternoon of Sunday, Nov. 8, awoke to his importance while patrolling through Broadway between 32d and 33d streets, and decided that John Nelson, a foreman in charge of a gang of laborers then making repairs to a line of gas pipe running through the roadway at the point above indicated, was responsible for too great a breach in the orthodox rules for observing the Sabbath. Accordingly foreman Nelson was arrested, and on Monday was arraigned before the presiding magistrate at Jefferson Market police court. General Charles Roome, President of the Consolidated Gas Company, was in attendance, and made affidavit that the work on which Nelson and his men were engaged was a necessity, whereupon defendant was discharged. Thus it would appear that officer Casey, in his interpretation of the Penal Code, was slightly in error.

BROCKTON, MASS., HAS AN ELECTRICAL EXPERIENCE.—At about 8 o'clock on the evening of Saturday, October 24, the good people of Brockton were thronging the shops intent on their usual Saturday evening purchases, the promenades were crowded, and Brockton's electric lights (Edison system) were at their best—which of course is not saying much for them. Without the slightest premonition the purchasers and sellers and promenaders were treated to a "display of darkness;" although that assertion might be slightly modified in respect to the delegations who happened to be in establishments where gas still held sway. The city rink had one of the largest crowds of the season on its floors; and at the Peoples Theater a large audience was listening to the "Chimes of Normandy;" both places patronized the electric light company, and hence were left in darkness. All sorts of improvised methods of illumination were resorted to, and, as might be supposed, the electrical suppliers were loudly condemned. An official of the Edison Company explained the eclipse with the statement that "the whole trouble was caused by a leak in the Elm street main. They could not find it, and in order to make an examination had to shut off the northern circuit, too." All of which, no doubt, will go a great length in satisfying the shopkeepers of Brockton!

BUT IT WAS ONLY AN EXPERIMENTAL STATION.—Of course, the above occurrence attracted attention from the residents of the neighboring towns, but more especially did it receive the notice of those dwelling in localities where the electricians are now putting in plants. At New Bedford Mr. C. R. Price, in charge of the local Edison corporation, was appealed to for information as to the likelihood of such an event happening there. He greeted the inquirers with the statement that the Brockton station had always been regarded as an "experimental" station. He admitted that similar "accidents" had occurred in Brockton before, and would likely occur there again: but in Lawrence and New Bedford these happenings were outside the pale of possibility. It was the experience gained at Brockton that enabled them (the electricians) to do perfect work at other points, etc., etc. And we would submit it is rather rough on the Brocktonites that they should be obliged to put up with such explanations, and "pay the piper" besides. Surely, if the scheme is found to work satisfactorily at other points, would it not be fair to remove Brockton from the realm of experimentation? The bare truth about Brockton is this—it is not nearer to nor further from the experimental stage, in regard to its "electric station," than any other city or town in the country which now harbors those interested financially in the development of electric lighting establishments.

ANOTHER GAS CONSUMERS BENEFIT COMPANY.—Among the recent certificates of incorporation filed at Albany, N. Y., we note one that gives birth to the "Gas Consumers Benefit Company," of Long Island. The incorporators are S. W. Knowles, H. L. Favis, E. H. Brown, D. Birdsall, and R. F. Brown. The concern is capitalized at $100,000, and principal office of company is to be located in Brooklyn. Its objects, as set forth, are the "manufacture and sale of gas fixtures, gas burners, and other machinery and appliances for the utilization of gas for light, heat and power."

POISONED BY INHALING GAS.—The following cases are reported: At Charlotte, N. C., on night of Oct. 26th, W. O. Moore, of Chester, S. C., accompanied by a female, registered at the Central Hotel, and both were shown to a room. At 4 o'clock following morning the smell of escaping gas attracted the attention of a porter, and the escape was traced to apartment occupied by Moore and his companion. Investigation developed the fact that Moore was dead, while the woman, though unconscious, was still alive. The physicians summoned said she would probably recover. A defective burner key was responsible for the gas escape. On morning of October 28th John W. Piper, of Franklin Falls, N. H., owner of an orange grove in South Florida, and at the time above mentioned an inmate of the Grand View Hotel, Jacksonville, Fla., was found in an insensible condition in his apartment. The room was filled with gas that had escaped from a turned-on burner. His recovery was looked upon as doubtful. "At Baltimore, Md., on date of Nov. 6th, John Knell, with his family, consisting of wife and three children, were found at their home on St. Mary street, all (except a son) apparently dead. They were affected by escaping gas. Elizabeth, aged 13, the second daughter, is dead, and Mary, the elder daughter, is in a precarious condition. Mr. Knell, his wife, and the boy are likely to recover."—N. Y. *Sun*, Nov. 7.

Correspondence

[The JOURNAL is not responsible for the opinions expressed by correspondents.]

Mr. Allen Advertises the "Allen-Harris Process."

CITIZENS GAS COMPANY, POUGHKEEPSIE, N. Y., Oct. 30, 1885.

To the Editor AMERICAN GAS LIGHT JOURNAL:

You have from time to time referred to me as "Mr. Allen, of Poughkeepsie," and "Friend Allen," to which I do not by any means object, and only hope that you may never have occasion to refer to me in any other terms than those of friendship. But I desire to say that I am not "engaged on the work of amusing others (if not himself) with comparisons as to the relative dangers of water and coal gas." It has not been a matter of mere amusement for me in attempting to write intelligently upon the very important practical and scientific subject of the manufacture of gas for illuminating and heating purposes. I have endeavored to give some information in relation thereto. You are mistaken in saying that "he has turned his attention to the matter of proving that marsh gas is one of the most deadly poisons known to the toxicologist." I stated that marsh gas was more dangerous to life and health than carbonic oxide, against which so much has been (very unjustly) said. I showed that light carburetted hydrogen, or marsh gas, the basis of coal gas, is the same gas as that which is found in the bottoms of wells and in mines, and that it would not sustain life for a minute—it being an entirely irrespirable gas. I did not say "poisonous." I further stated that carbonic oxide had been used for years as an anæsthetic, its action being similar to that of chloroform; showing that carbonic oxide is not an irrespirable gas, but may be breathed without unfavorable results. To sustain my statements I quoted such famous authorities as Dr. M. Ozanam, M. G. Tourdes, Adam Wurtz, Leblanc, Devergie, and others, who have safely used carbonic oxide as an anæsthetic upon man and the lower animals. Dr. Ozanam says: "The twenty-five experiments which we made, and several of which have been repeated upon the same animals, show that the use of this gas is not as dangerous as was formerly believed, since we have but one case of death among many animals so delicate as rabbits." M. G. Tourdes says: "The two fundamental facts are the harmlessness of the gas used, and its anæsthetic action." In comparing the effects of carbonic oxide with gas from coals, Leblanc and Tourdes found that when carbonic oxide was purposely used to produce fatal results upon animals, 12 per cent. mixed with air killed rabbits in seven minutes, and that 2 per cent. of coal gas killed such animals in twelve minutes—which is as 84 to 24 in favor of carbonic oxide. These are important facts, and fully sustain my statement, heretofore made, that carbonic oxide is not as dangerous to life and health as coal gas. I fully agree with you that the mere statement of these matters "will fall short of transmitting his (my) name to posterity."

In referring to my statement that we have "purified an average of 113,000 cubic feet per bushel of ordinary slacked lime—no other process has ever approached such results—the highest average obtained by the largest and best coal gas companies has fallen short of 5,000 cubic feet," you exclaim, "Oh! Mr. Allen!" which was a very mild way of expressing doubt as to the truth of such statements. We have indubitable proof of what we have done in that respect. As to what the "largest and best coal gas companies have done," I took the report of Prof. Love, expert gas chemist, of New York, in relation to the average quantity purified by the Manhattan Gas Light Company, the Metropolitan, etc., as published, I think, in your own columns, which I considered good authority.

You call my attention to repeated cases of death from water gas made under the Lowe and other water gas processes. I have nothing to say in relation thereto, unless it be, that if such cases are really exceptional under similar circumstances with coal gas, death must have resulted from impurities in the gas produced by internal, intermittent, and changeable heats, and not from pure water gas as produced under the Allen-Harris process. We have pursued, for more than ten years, our original system of uniform, high external heats, and continuous production of gas, and, by practical working, have perfected our process, as shown by three new letters patent for improvements obtained by us during the past few months. People have been exceptionally exposed to the effects of our gas without a single case of death, or even one day of illness.

If I should say that instead of drawing our retorts once even in eight days, as heretofore, we have not, under our present system, drawn them or lowered their temperatures since we fired them on the first of October of last year, and that we do not expect to draw them during the coming winter, nor until the furnaces require repairing, you may be more surprised than at my stating that we had purified 113,000 cubic feet of gas per bushel of ordinary slacked lime; but nevertheless it is true, and we extend to you a hearty invitation to come and examine our works for yourself.

Still the main point covering all these matters relating to coal and water gas is, "How do customers like the gas furnished; and the bills when presented?" The electric light company's managers have worked here for six months past, but have only 15 lights among our consumers—two of which are put where no gas was used before—while they have 50 or more among the old Poughkeepsie Company's patrons, and who, I think, have been furnished with as good gas as is usually made under the old process. This tells more than words in favor of the "Allen-Harris water gas," which gives a pure, brilliant, uniform, white light, and consumers are satisfied.

A. L. ALLEN.

The Market for Gas Securities.

During the fortnight transactions in Consolidated gas were on a large scale, and at the time of writing (noon of Oct. 31) quotations for same show that the upward movement still progresses—sales being recorded at 104¼, with bid and asking prices at 104¼ and 105 respectively. Those of our readers who followed the advice, steadfastly given in this column, to buy Consolidated have no reason to grumble at the result, and we urge those who hold the shares not to relax their grip. The security is a "good thing," even at present figures. Other city shares are fairly steady. Brooklyn gas stocks are dull and strong. The old Brooklyn Company's regular semi-annual dividend of 6 per cent. is payable to-day. Chesapeake, of Baltimore, Md., is offered at 62, and that asking price seems to be ridiculously high. Consolidated of same city is rated at 44 to 45. At auction, on Nov. 4th, 58 shares Ithaca (N. Y.) gas at 53½; 52 shares Cincinnati (Ohio) gas at 184½; 30 shares Citizens, Brooklyn, N. Y., at 90; and one share Metropolitan, same city, at 96. This last stock seems to us to be a decided purchase at the market rate.

Gas Stocks.

Quotations by Geo. W. Close, Broker and Dealer in Gas Stocks,

16 Wall St., New York City.

November 16.

☞ All communications will receive particular attention.

☞ The following quotations are based on the par value of $100 per share.

	Capital.	Par.	Bid	Asked
Consolidated	$35,430,000	100	104½	105
Central	440,000	50	60	70
" Scrip	220,000	—	47	57
Equitable	2,000,000	100	134	137
" New Stock			123	125
" Bonds	1,000,000	—	107	110
Harlem, Bonds	170,000	—	—	—
Metropolitan, Bonds	658,000	—	113	—
Mutual	3,500,000	100	134	135
" Bonds	1,500,000	1000	104	107
Municipal, Bonds	750,000		—	—
Northern	125,000	50	50	—
" Scrip	108,000			
Gas Co's of Brooklyn.				
Brooklyn	2,000,000	25	125	130x
Citizens	1,200,000	20	88	90
" S. F. Bonds	320,000	1000	106	110
Fulton Municipal	3,000,000	100	158	159
" Bonds	300,000		104	108
Peoples	1,000,000	10	86	87
" Bonds	290,000	—	105	110
" "	250,000	—	90	95
Metropolitan	1,000,000	100	95½	96½
Nassau	1,000,000	25	128	—
" Ctfs	700,000	1000	101	102
Williamsburgh	1,000,000	50	162	—
" Bonds	1,000,000	—	111	114
Richmond Co., S. I.	300,000	50	64	75
" Bonds	40,000	—	—	—
Out of Town Gas Companies.				
Buffalo Mutual, N. Y.	750,000	100	80	85
" Bonds	200,000	1000	95	100
Citizens, Newark	918,000	50	103	115
" " Bonds	124,000	—	105	110
Chicago Gas Co., Ills	5,000,0000	25	130	140
Peoples G. L. & C. Co., Chicago, Ills			8	12
Cincinnati G. & C. Co.			184	187
Consolidated, Balt.	6,000,000	100	44	45
" Bonds	3,600,000		107	107½
Chesapeake, Balt.			—	62
Central, S. F., Cal.			58	63
Capital, Sacramento, Cal.			54½	56
Hartford, Conn	750,000	25	132	138
Jersey City	750,000	20	135	140
Laclede, St. Louis, Mo.	1,600,000	100	97	100
Louisville, Ky	1,500,000	50	95	100
Montreal, Canada	2,000,000	100	181	182½
New Haven, Conn		25	166	170

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The Grand Rapids Gas Company will offer for sale in 1886 a **Complete Ten-Inch Plant** for making coal gas.

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A system by which the elements and their valences are represented by illustrations and solid bodies.

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Sewer Pipe, 3 to 24 in. diameter.

Glass Pot Clay, Ground Fire Clay, in barrels and in bulk. All kinds of Fire Clay Goods.

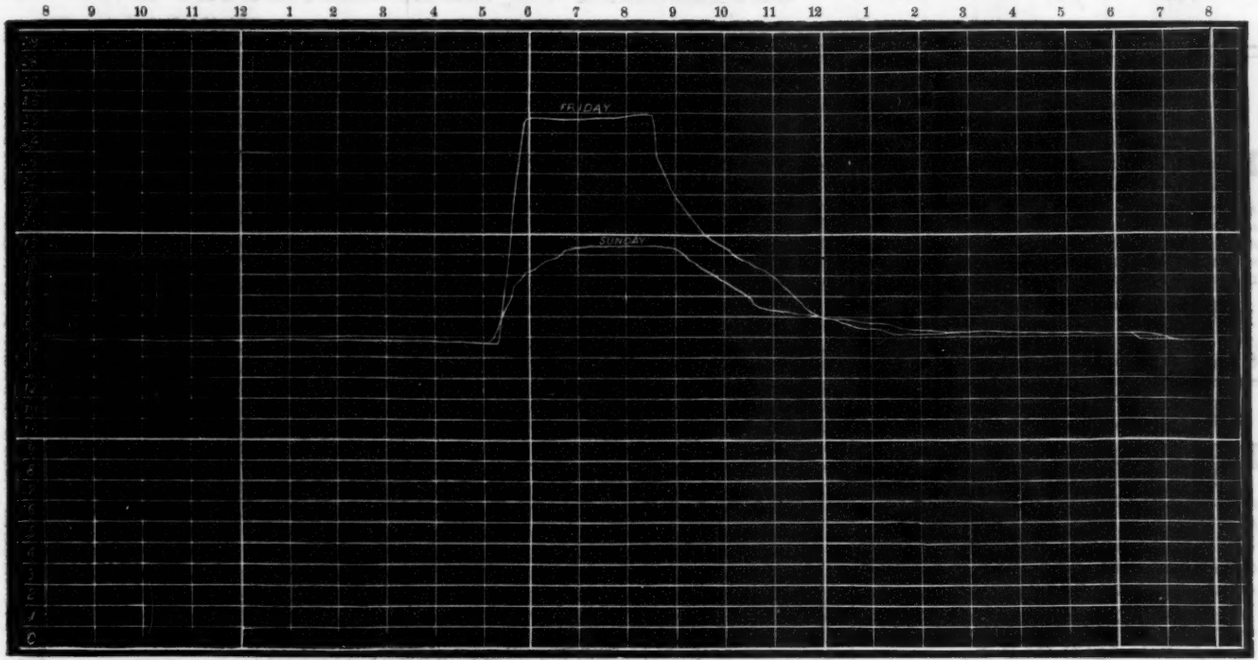
Iron Sponge,
GAS EXHAUSTERS,
AUTOMATIC GAS GOVERNORS,
CONNELLY & CO., Limited,
No. 407 BROADWAY, NEW YORK CITY.

CONNELLY'S AUTOMATIC GOVERNOR FOR STREET MAINS.

We give herewith a few late letters from gas companies using our Governor, and also a cut (exact reproduction) of two pressure sheets from the Quincy (Ill.) Gas Works. A careful inspection of the cut will reveal more concerning the Governor's accuracy and reliability than we could express in all the columns of the JOURNAL. It shows clearly that the Governor is endowed with more than human intelligence, and fully verifies a late remark of a certain "Western Member"—"Connelly's Governor is *brains in iron.*" At Quincy the stores close early, and on all week nights excepting Saturday the Governor begins to reduce the pressure at about 8:30 P.M.; but on Sunday evening (when the consumption is so light that the Governor puts on only 19-tenths pressure) it is *one-half hour later* beginning to reduce—its action being the reverse of that followed by nine out of ten intelligent managers under the same circumstances or conditions. Although the consumption is much less on Sunday nights than on others, the volume per hour remains the same until 9 o'clock, when the church lights are extinguished. The Governor thus shows a finer discrimination than human intelligence is capable of. We do not boast of what our Governors "can" or "will" do, but submit evidence of WHAT THEY ARE DOING! We now have 43 of these machines in practical operation, and experience has taught us that a machine so delicate and sensitive in its construction, liable to be placed under such widely varying conditions, *cannot be perfected on paper.* Our late improvements enable us to send out a Governor to *any works*, capable of being adjusted to any possible conditions or requirements after it is in place. A 20-inch Governor can be sent to one works and adjusted to hold 3-tenths day and 40-tenths night pressure, and its duplicate or counterpart may be sent to another works having same consumption and initial pressure, and be set to hold 10-tenths day pressure and 11-tenths night pressure—both working perfectly as desired. Such range of adjustment is absolutely necessary in an Automatic Governor, not only to secure the desired action in the beginning, but to be prepared to meet the new conditions sure to follow the building of a heavier holder or a large increase in capacity of the mains. No Governor in this country or abroad, in use or illustrated on paper, is constructed with such a range of adjustment, and to secure it would require a radical change in principle.

Another important feature of our Governor *not found in others* is the *absolute impossibility of the valve sticking in its seat* and shutting off the gas. We do not permit the valve to *enter* its seat; it is so constructed that it bears at *right angles* on a knife-edge seat, and must fall away from it when its supporting pressure is reduced in the least degree. The great value of this feature will impress itself on the careful Gas Manager. In short, our experience has enabled us to meet every possible requirement in Automatic Governors (as the accompanying letters attest), and we can unhesitatingly guarantee every Governor sent out to give perfect satisfaction in every respect, or will remove same at our expense. It is useless for us at this late day to waste any words on the *economy* and *satisfaction* derived from such a machine; and no progressive Engineer or Superintendent would to-day plan a works without locating an Automatic Governor. As they are finely finished and highly ornamental, their proper place is in the Office or Meter Room. As one of these Governors will *save its cost* in a short time, no company should hesitate to place one. The more perfect distribution and satisfaction given consumers are additional advantages that cannot be estimated in dollars and cents. We publish below a few letters, and will publish others in the following numbers of the JOURNAL.

CONNELLY & CO., Ltd., 407 Broadway, N.Y.



Card Showing Pressure at Quincy (Ill.) Gas Works, for Oct. 16th and 18th, 1885.

Quincy, Ill.

QUINCY GAS LT. AND COKE CO., QUINCY, ILL., Oct. 21, 1885.

Messrs. CONNELLY & Co.—Gentlemen: Yours of 27th is at hand. You are at liberty to use the pressure sheets in the way you wish, and also my name in testifying to the merits of the Connelly Governor, as *I cannot say too much in its praise.* Yours very truly, A. W. LITTLETON.

Long Island City, N. Y.

EAST RIVER GAS LT. CO., LONG ISLAND CITY, N. Y., Nov. 11, 1885.

Messrs. CONNELLY & Co.—Gentlemen: Replying to yours of 10th inst., I would say that the 16-inch Governor furnished by your firm has afforded me infinite relief from the anxiety always felt regarding conditions of pressure in our mains. Heretofore we have had to rely upon such humanity as is generally found about all medium-sized gas works—the reliability of which most men connected with the gas business are familiar with; but now we have become perfectly satisfied that when any demand is made, either day or night, let it be large or small, it will be instantly met. Behind our Governor we carry full holder pressure—52-tenths; before it our minimum pressure is 15-tenths, and the maximum 30-tenths. We allow the Governor to govern us, and find that our rules have been altered by it. It takes off pressure sometimes as early as 9 o'clock, giving the varying pressure needed until, at 12:30, it stands at the minimum point. On Sunday night it elects to give us only 20-tenths, instead of maximum 30-tenths; and it is allowed to do so, as its judgment of what is needed is perfect. Close watching during a storm will convince anyone how sensitive it is, and how quickly it answers the varying conditions caused by the wind, and by its watchfulness always maintaining a steady, even pressure at the point required. In fact, the instrument is far in advance of any other used for a like purpose that I know of.

Yours truly, C. A. KITTLE, General Manager.

Cleveland, Ohio.

PEOPLES GAS LT. CO., CLEVELAND, OHIO, Nov. 9, 1885.

Messrs. CONNELLY & Co., LTD.—Dear Sirs—Yours of the 6th came duly to hand. With reference to the Governor, in view of my short experience with it (only about three weeks) perhaps I ought to be modest in expressing an opinion; but from the standpoint of experience I feel justified in saying *it does its work perfectly.* Cards are at the works, or would enclose some to you. Will let you have them when you come this way. Meantime I am

Very truly yours, EDWARD LINDSLEY, Eng. and Supt.

Athens, Ohio.

ATHENS GAS LT. CO., ATHENS, OHIO, Nov. 9, 1885.

Messrs. CONNELLY & Co.—Gentlemen: Your favor inquiring after the working of the Connelly Governor received. It has now been in use more than a year, and we find it as recommended in every particular. It does all the work required of a Governor, and strictly *automatically.* I have not the first disadvantage to suggest, after a trial at all seasons of the year. We consider this investment the most profitable and economical of any about our works, and have recommended it to all inquirers. Our leakage account has been reduced one-half. Yours very truly, C. H. WELCH, Supt.

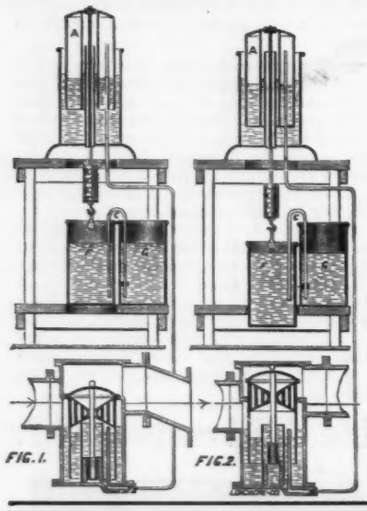
Beaver Falls, Pa.

BEAVER FALLS GAS CO., BEAVER FALLS, PA., Nov. 9, 1885.

Messrs. CONNELLY & Co.—Gentlemen: It affords me no little pleasure to reaffirm that in my opinion no gas works is by half complete that lacks the advantages to be derived from an Automatic Governor such as yours has proved to be after more than a year's steady work—with positively no attention but oiling. The second Governor we purchased of you will shortly be placed in 6-inch line supplying the town of New Brighton.

Hastily yours, J. M. CRITCHLOW, Supt.

Helme's Automatic Regulator



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FOULIS GAS GOVERNOR.

This Regulator and Governor combined are absolutely free from friction, excepting what is due to the moving of the float *A* and valve through the water. There are no journals to carry weight, and the moving parts are so nicely balanced that they do not rub against the surroundings.

The well-understood action of the inverted syphon in a fluid is made available in loading and unloading the float of the Regulator. As the demand for gas increases the float *A* descends, and with it the vessel *F*, drawing into it from the tank *G* a portion of the fluid it contains. This additional weight increases the pressure at the Governor sufficiently to overcome the friction in the pipes due to the increased amount of gas passing. When the shutting off begins a reverse action takes place. The float and vessel *F* begin to rise, and in doing so return to the tank *G* the fluid taken from it while descending.

From this it can be seen that any desired variation in pressure can be arranged for at the Governor, so as to maintain a uniform pressure in center of town. When once adjusted to the minimum day pressure and maximum night pressure it requires no further attention. For prices and further particulars inquire of

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Is superior to any other Portland Cement made. Its extraordinary strength permits a greater addition of sand, while its acknowledged uniformity insures the most reliable and strongest work. It is therefore the most economical to use. Circulars, with testimonials and tests, sent on application.

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GIBBS PORTLAND CEMENT

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23 Liberty St., New York.

GEROULD'S IMPROVED RETORT CEMENT.

Used by most of the Gas Companies of the United States with perfect satisfaction. Manufactured by

C. L. GEROULD,
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N. B.—As Manchester is a shipping point, all freight can be shipped as cheaply as from Boston or New York.

BROOKS, SHOOBRIDGE & CO.

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IMPORTER OF THE BEST
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"DINAS" SILICA FIRE BRICKS AND BLOCKS
For Coke Ovens and Gas Works.
Correspondence invited. Lowest prices.

THE ALBO-CARBON LIGHT!

A new system of Carburetting heated Gas by means of a solid material, whereby its illuminating power is increased more than three-fold.

SUPERIOR TO ALL OTHER SYSTEMS FOR
Economy, Safety, Illuminating Power and General Practicability,

The Albo-Carbon process enables Gas Companies to supply a light equal to the Arc Light, at a much less cost. Several Gas Companies are now using this system. The process is extensively used in Europe, and is being rapidly adopted in this country.

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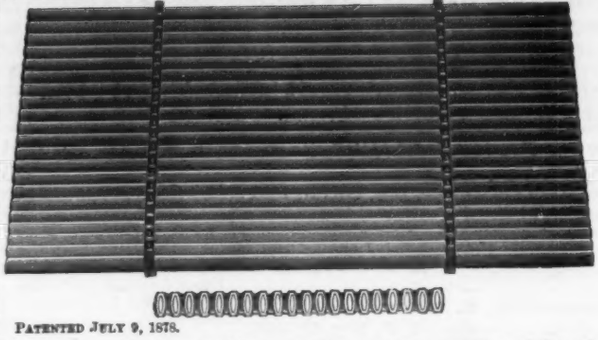

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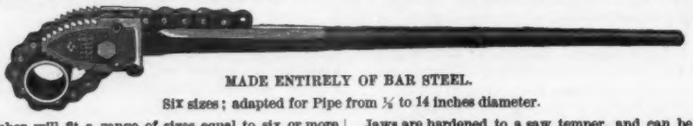

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Each number will fit a range of sizes equal to six or more pairs of common tongs, while it will outwear an equal number of any kind.
All parts are interchangeable, and can be readily renewed.

Jaws are hardened to a saw temper, and can be sharpened with a file.
Does not crush pipe; has a quick grip; never slips; chain will not unhitch while in use, but can be instantly released.

J. H. WILLIAMS & CO.,
Manfs. of Every Description of Iron and Steel Drop Forgings.
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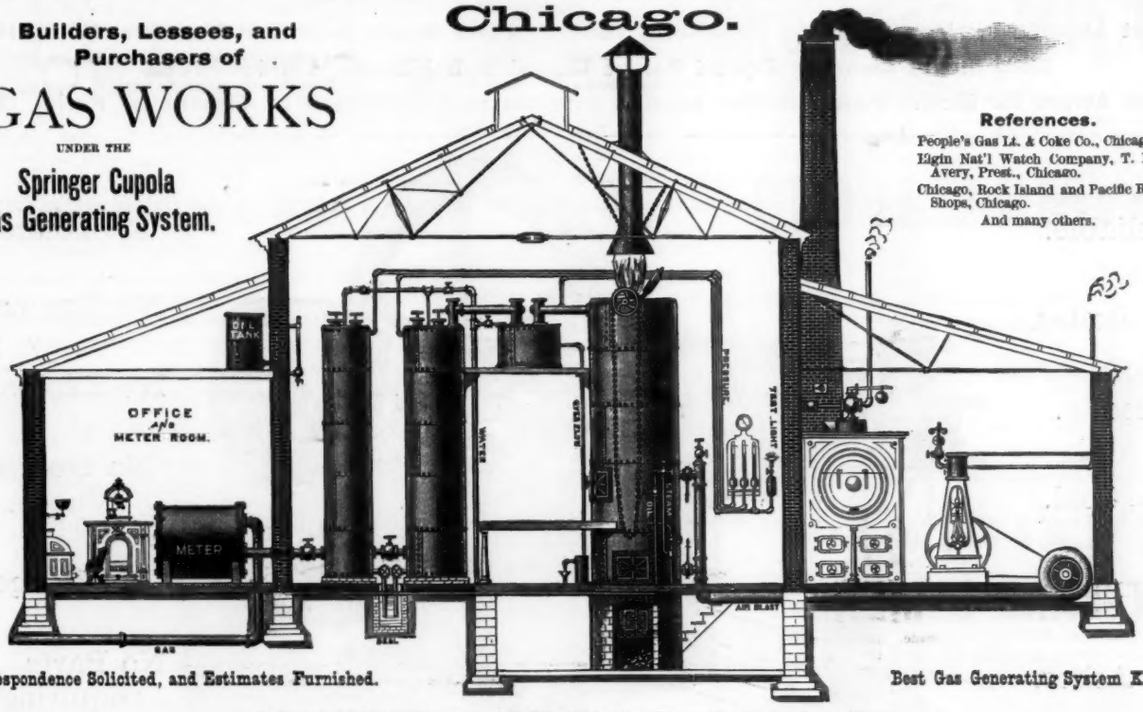

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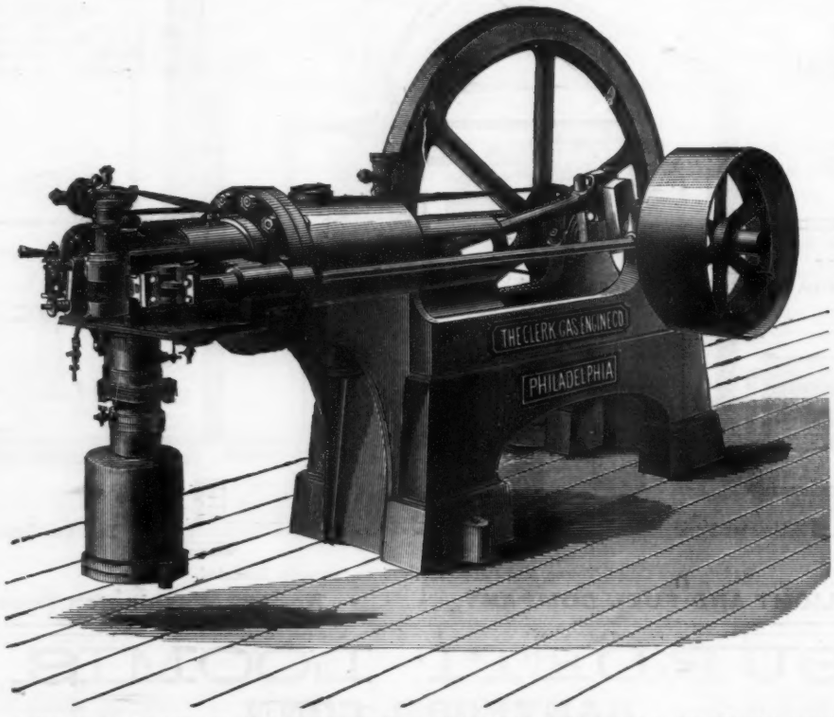

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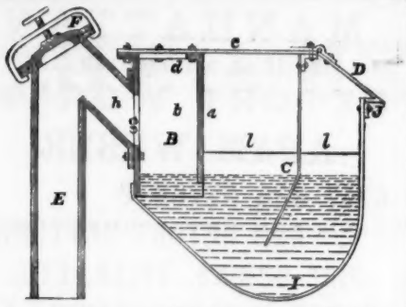

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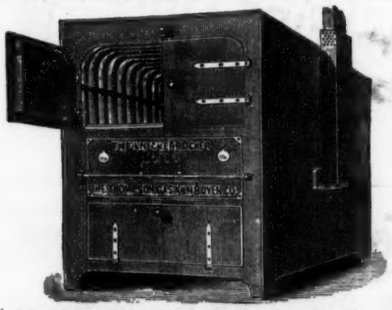

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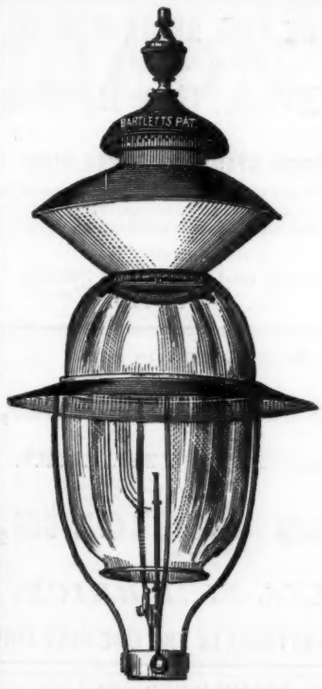

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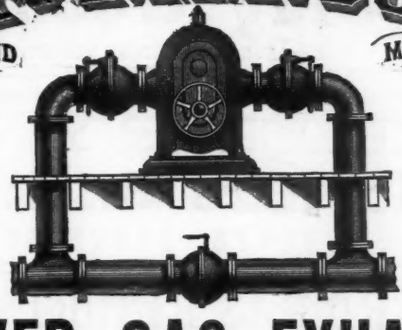

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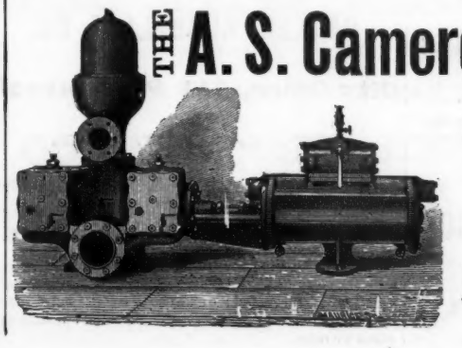

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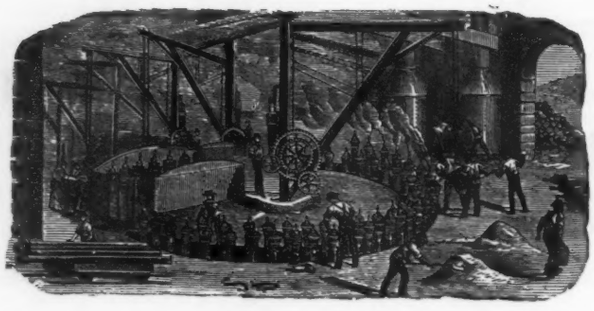

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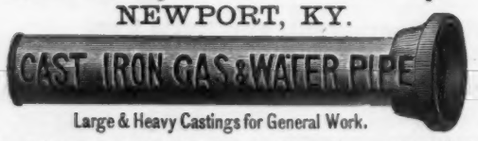

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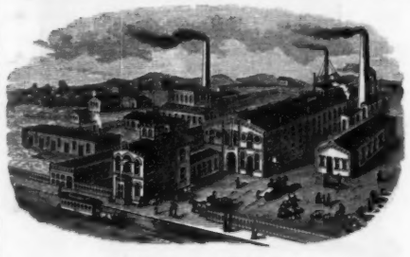

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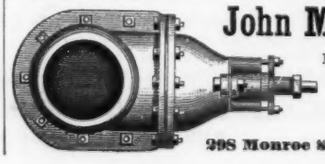

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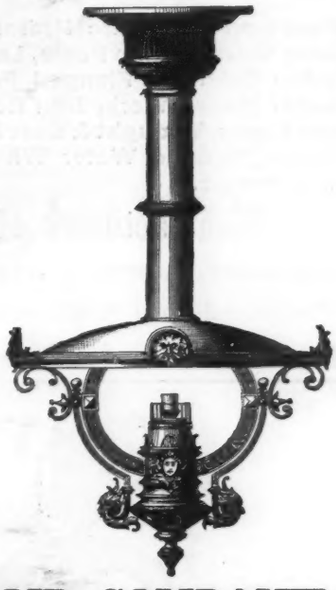

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1877	4,000,000	cubic feet.
1878	4,750,000	"
1879	24,545,000	"
1880	42,967,500	"
1881	36,462,500	"
1883	39,300,000	"
1883	57,735,000	"
1884	26,177,500	"
Total	235,937,500	cubic feet.

Total Number and Capacity per 24 Hours of "Standard" Washers Erected and in Course of Erection in the Several Countries

	Number.	Cubic Feet per Day.
Great Britain	151	157,070,000
Western Hemisphere	88	39,337,500
Australia	18	12,150,000
New Zealand	2	650,000
France	6	4,550,000
Belgium	8	5,430,000
Germany	16	8,200,000
Holland	4	4,160,000
Denmark	1	150,000
Russia	2	3,500,000
Spain	1	350,000
India	1	400,000
Total	348	235,937,500

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Yours, etc.,
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Dear Sir—Our Scrubber appears to run to our entire satisfaction, and we are pleased to say that it takes out all the ammonia from the gas. This is *very* satisfactory to us, as we were ruining our meters at a fearful rate heretofore. The amount of water used is very inconsiderable as compared with our old process. The machine runs very smooth and still. Very respectfully,

H. C. LEONARD, Secretary.

"Standard" Washers Ordered Recently.

	Cu. Ft. per Day
Anneberg Gas Co	200,000
Bombay Gas Co	400,000
Brussels Co	1,250,000
CHICAGO, two, 1,000,000 each	2,000,000
Chemnitz Gas Co	1,000,000
CITIZENS GAS CO., BUFFALO	750,000
Coke Works in Zabre, Ober-Schlesien	1,500,00
Cokerei der Friedenshutte, Upper Silesia	500,000
Dumfries Corporation	250,000
Dunedin Gas Co., New Zealand	400,000
GEORGETOWN, D. C	250,000
King's Lynn Gas Co	300,000
Leiden, Holland	600,000
Lincoln Gas Co	400,000
Liverpool Gas Co	2,000,000
" "	3,000,000
LOUISVILLE GAS CO	1,500,000
Numea Gas Co	100,000
PITTSBURGH GAS CO	1,500,000
PAWTUCKET, R. I	500,000
PORTLAND GAS CO., Oregon	562,500
SAN FRANCISCO GAS CO	4,000,000
Sheepbridge	40,000
ST. LOUIS GAS CO.	2,000,000
Sydney Gas Co	2,500,000
WASHINGTON, D. C. GAS CO	2,000,000
Whitchurch Gas Co	175,000
Total	29,677,500

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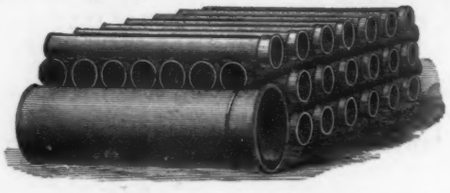

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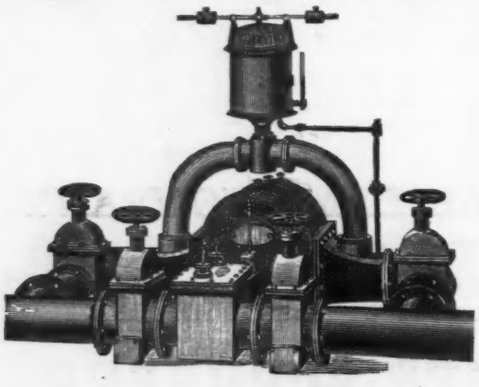

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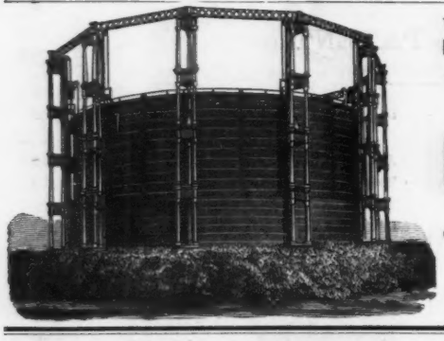

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Akron, "	"	80,000	"
Xenia, "	"	10,000	"
Adrian, Mich	"	65,000	"
Ypsilanti, Mich	"	25,000	"
Muskegon, "	"	70,000	"
South Bend, Ind	"	70,000	"
Anderson, "	"	20,000	"
Plainfield, "	"	10,000	"
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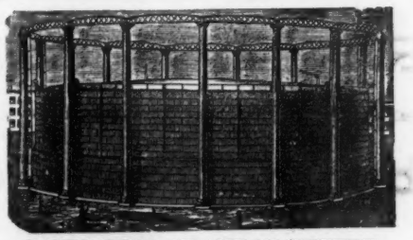

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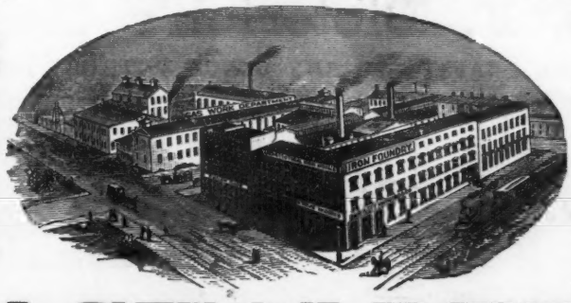

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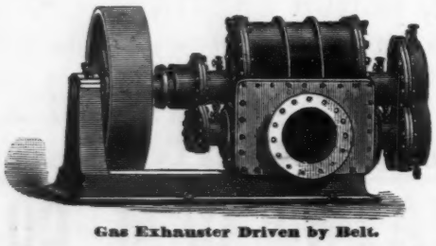

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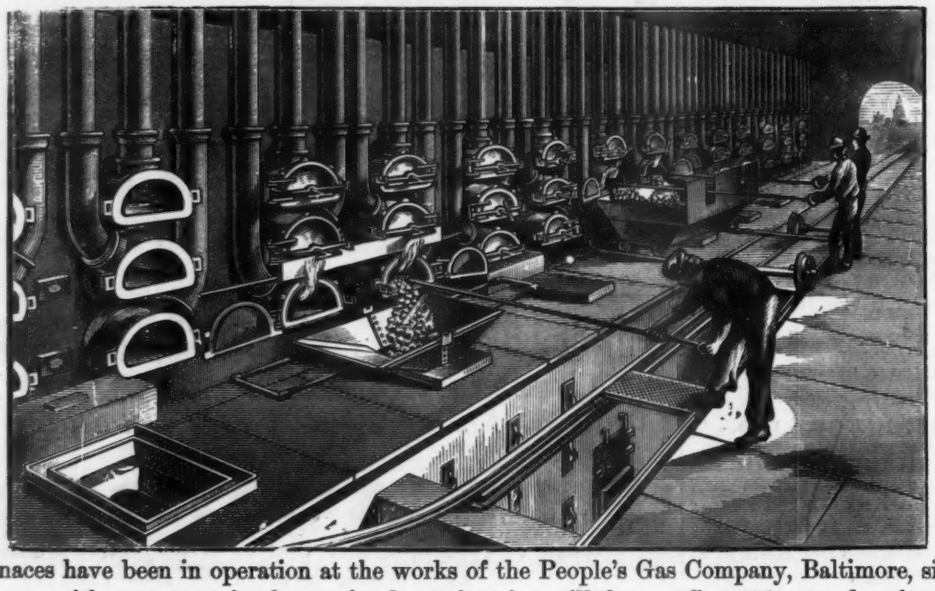

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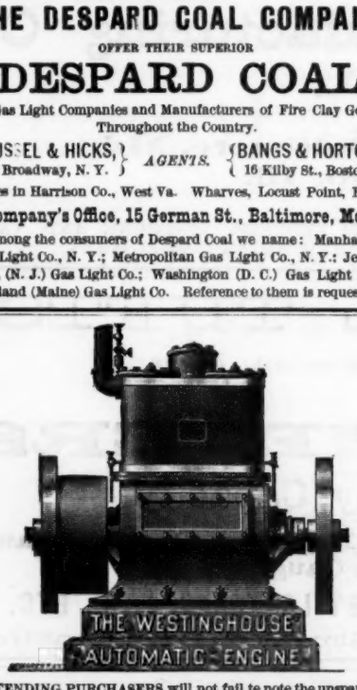

INTENDING PURCHASERS will not fail to note the unsparing and unanimous condemnation which the WESTINGHOUSE ENGINE receives—from its competitors. To the thinking man this fact is significant, and doubtless has much to do with the creation of our counter argument which we append below.

Very respectfully, **Westinghouse Machine Co., PITTSBURGH, PA.**

SALES FOR OCTOBER, 1885.

58 Engines, aggregating 2,055 H.P., distributed as follows

1 of 125 H.P.	2 of 45 H.P.	3 of 15 H.P.
1 " 100 "	7 " 40 "	1 " 12 "
3 " 75 "	7 " 35 "	3 " 10 "
1 " 65 "	6 " 30 "	3 " 8 "
4 " 60 "	3 " 25 "	3 " 5 "
4 " 50 "	5 " 20 "	1 " 4 "

Of these, 7 were second orders; 2 were third orders; 1 was a fifth order; 1 was a fourteenth order; 1 was a fifteenth order. *Total, 12 repeated orders (23 per cent. of sales) from actual users.*

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Attest—J. L. CAMPBELL, Secretary, pro-tem. Signed—A. T. GOSHORN, Director General J. R. HAWLEY, President.

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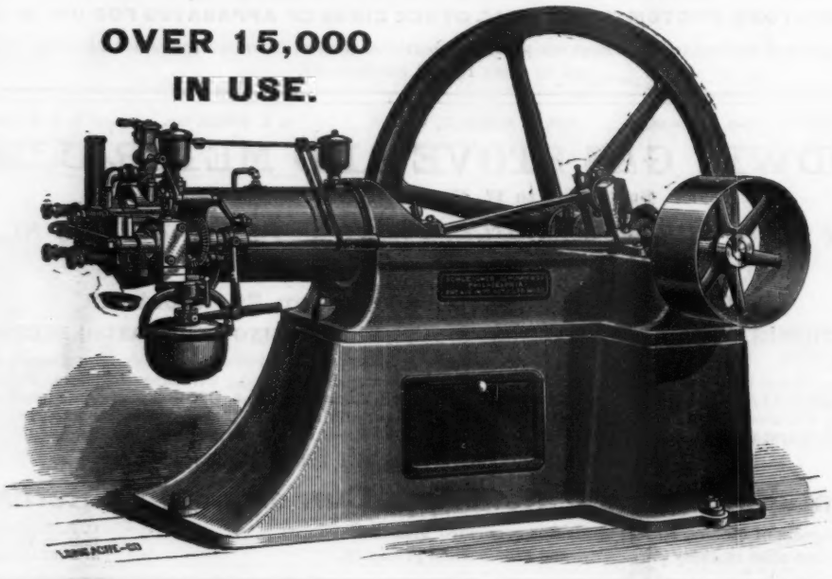

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